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FAMILY INCOMES AND LAND UTILIZATION IN KNOX COUNTY

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Family Incomes and Land Utilization in Knox County

By W. D. NICHOLLS, JOHN H. BONDURANT, and Z. L. GALLOWAY[1]

Knox County, situated in southeastern Kentucky and separated by only one county from the states of Virginia and Tennessee, is typical of the 38 counties or parts of counties which comprise the mountain region of eastern Kentucky. This region, which is part of the Cumberland Plateau, borders Ohio and West Virginia on the East, Virginia on the Southeast and Tennessee on the South. Its approximate western border may be indicated by a line extending southwestward from the northwestern corner of Greenup County on the Ohio River to the Southwestern corner of Wayne County on the Tennessee border.

The topography of this area is largely steep hillsides and narrow valleys. The surface rocks are sandstones and shales. The hillside soils are mostly silt loams and sandy loams usually containing sandstone and shale fragments. They are of low productivity for most of the field crops grown in the region, but produce good timber. The slopes facing east and north generally have deeper soil and are therefore better fitted for tillage than those facing west and south. The alluvial, or bottom, soils are sandy, silt or mixed loams. Practically all the soils in the area are strongly to moderately acid, deficient in phosphate and in humus. On the whole, the bottom soils, if well drained, are considerably more productive than the hillside soils. This is particularly true if flood waters occasionally leave a good silt cover.

This region comprises about a fourth of the area and population of the state. Forty-seven percent of the families are classed as farm families by the federal census, but there are as many rural

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non-farm families, the area being populated largely by workers in coal mining and other non-farming occupations, a large proportion of whom live in the open country. The area as a whole is poorly adapted to agriculture. Because of the deeply dissected land surface, narrow valleys, steep slopes, and sharp ridges, there is very little good farming land.

The lack of an adequate acreage of suitable land in this region in relation to the number of persons living on the land, coupled with the lack of opportunities for non-farming employment, has resulted in much poverty. Over a considerable period the people in this region derived a large proportion of their incomes from lumbering and coal mining. Of a group of 228 typical farm families in Knott County, in 1930, only 22 derived their living mainly from farming, and most of the land which they cultivated was steep and eroded hillside. Since 1929 the opportunities for acquiring an income from non-farming sources have decreased to a considerable extent. Furthermore, many families who had previously left their home communities to engage in mining and other industrial occupations were forced, by the shutting down of these industries, to return to the communities from which they had migrated. A careful estimate made by county agricultural agents of these counties at the instance of the President's Organization on Unemployment Relief indicated that 7600 families returned to 22 of these counties during the two years prior to March 1, 1932, and thereby increased by one-sixth the families in the area. During a considerable part of the two-year period following 1932 more than half of the families in the area were on public relief.

The population per square mile in this area is greater than that of many of the more level and fertile agricultural counties of Kentucky. For example, the 1930 Census shows the population per square mile for Knott, Magoffin, and Laurel Counties in this area to be 44, 52, and 47, respectively, as contrasted with population of 41, 41, and 59, respectively, in the three rich agricultural counties, Henry, Shelby, and Bourbon, in the Bluegrass region of Central Kentucky. Two-thirds of the counties in the Kentucky mountains gained 20 percent in population during the decade from 1920 to 1930.

The marked disparity between this and the better agricultural sections of Kentucky in the resources which condition standards of

living is exemplified by contrasting Laurel County in this area with Bourbon County in central Kentucky. The amount of land in farms in the two counties is practically the same. Much of the tillable land in Laurel County is submarginal for farming. Practically all the land in Bourbon County is highly productive. The farm population in Laurel County is nearly twice that of Bourbon County. Laurel County has less than one-third as many acres of tillable land per person as Bourbon County. There are nearly twice as many children of school age in Laurel County as in Bourbon County, but the property subject to assessment for school or other purposes in Laurel County is only one-tenth of that of Bourbon County. Thus the local tax base for support of schools in Laurel County is only one-tenth that of Bourbon County.

SCOPE AND OBJECTIVES OF THE STUDY

This is one of a series of economic and social studies begun in 1929 which were undertaken to throw light on the problems of land utilization and conditions of living in the Eastern Kentucky Mountain region which have become increasingly acute during recent years. The principal objectives were: to classify and show the present use and condition of land, particularly as to its slope, degree of erosion, productivity, and present and prospective ability to afford a living for its occupants; to ascertain whether and to what extent reforestation should be encouraged; to obtain data on family incomes, costs of and returns from crops associated with the various land classes and ranges of slope; to obtain information on housing and other factors of the living standards of the people and on the composition and nativity of families and the extent to which emigration or immigration affect the problem. It was intended that such information should furnish a basis which would be useful to the people of this region in forming judgments as to their present and future plans, and to public agencies needing information upon which to base action on such questions as public relief and the purchase of land for state or national forests.

The territory concerned in the present study included all the land in two contiguous magisterial districts in Knox County, comprising approximately 68,000 acres making up the entire drainage basin of Stinking Creek, one of the important tributaries of Cumberland River (Figure 1). This territory was selected because it presented a situation typical of many others in eastern Kentucky

in which a relatively dense population was undertaking to eke out a living chiefly by the cultivation of steep and eroded land. In addition to the Stinking Creek watershed, two areas in the county were chosen for an intensive study of the land utilization and

Figure 1. Knox County. Shaded area includes Magisterial district number three, near the Cumberland River, and district number four on the upper part of Stinking Creek. Land use and drainage data were obtained along the Cumberland River southwest of Barbourville and on Big Richland Creek north of Barbourville.

drainage problems of level bottom lands with particular reference to the possibilities of these lands in furnishing resettlement opportunities for families stranded on submarginal farms.

For the entire Stinking Creek area a land-use map was made based on inspection of the land by 10-acre blocks and showing the use to which the land was being put. The condition of representative farm houses including their size, type and location was determined. Family incomes and expenditures and the net spendable income were determined for each of 176 representative farm families. The data collected showed the cost of producing crops in terms of man labor, the cost of clearing land, and cycles of land use. The farm and family income data were for the farm year 1932 and the cost data for the years 1932 and 1933. Besides the study in the Stinking Creek watershed a further intensive study was made in two other areas in the county which included a large proportion of level creek and river bottom land.

KNOX COUNTY

Knox County occupies an area of approximately 356 square miles in the foothills of the Cumberland Plateau of the Appalachian Mountains. The Cumberland River traverses the southwestern part of the county. Except the narrow bottoms along the river and its tributary creeks, the land area of the county is made up largely of steep hills and narrow valleys formed by the wearing away of the Cumberland Plateau. The elevation of the land above sea level ranges from slightly less than 1,000 feet near the Cumberland River to 1500 feet on most of the hill tops. This study indicates that approximately 90 percent of the land has a slope of more than 15 feet in 100 feet distance and approximately 60 percent of all the land has a slope of 40 percent or more. Approximately 10 percent of the land of the county lies sufficiently level to permit intensive cultivation but much of this level land at present is unproductive because of poor drainage. Most of the level land has been cleared but approximately two-thirds of the hill land is in brush or woods. Practically all the land has been cut over. The brush land represents a new growth on land that has been cleared.

The total area of land in farms in Knox County reached a maximum of 199,218 acres in 1900. In 1930 there were 155,203 acres of land in farms and in 1935, 158,248 acres. Approximately 69.5 percent of the total land area of the county was in farms in 1935. The remaining 30.5 percent is largely land owned by lumber and mining companies and waste land.

The most important crop grown is corn. Annual legumes and grasses are cut for hay on most farms with level land. Small acreages of potatoes and garden products are grown mainly for home use. Most of the corn is grown on steep land that has been recently cleared. Approximately one-half of the cleared land is "lying out", having been cropped until it no longer yields enough to provide a return for labor. Corn yields range from 25 to 35 bushels per acre on newly cleared land to 5 to 15 bushels on land that has been cropped for 5 to 15 years. Hay is produced principally on the level bottom land along the creeks. Yields of hay usually range from ¾ to 1½ tons per acre. Most of the hillside land is too steep for the use of a mowing machine for harvesting and therefore very little hay is produced on this type of land.

The normal temperature in Knox County is suitable for most

crops commonly grown in the northeastern states. The average growing season is approximately 180 days and the average precipitation 50 inches, fairly well distributed thru the growing season.

Barbourville, the county seat, located near the center of the county, has a population of 2380. Corbin, a railroad center with a population of 8036 is located on the edge of the county but lies mostly in the adjoining county of Whitley.

TENURE STATUS AND CAPITAL INVESTMENT OF OPERATORS

Thirty-six percent of the 176 operators owned no land. Nineteen percent owned land and rented additional land and the remaining 45 percent farmed their own land. As would be expected, there was a considerable relationship between land ownership and the need for relief from public agencies. Fifty-seven percent of all the operators received such relief during the period to which the data of the study apply (March 31, 1932 to April 1, 1933). Seventy-seven percent of those who owned no land received relief aid while only 37 percent of the operators who farmed their own land received such aid.

The value of land and buildings averaged $1167, or about $18 per acre, for the 176 farms. The dwelling houses averaged $187 in value. The land and buildings of the operators who were full owners had a value of less than $1000, in a third of the cases; $1001 to $2000, in a fourth of the cases; and from $2001 to $3000, in a fifth of the cases. In only one case in eight was the value of the land and buildings more than $3000.

The farms averaged 63½ acres in total area. Twenty-four of the 176 farms were larger than 125 acres and 33 were smaller than 10 acres; 73 were smaller than 25 acres and 105 were smaller than 50 acres. Corn was the principal crop on these farms and averaged 9.7 acres for the 176 farms. Twenty-five of the farms had less than 5 acres of corn and 90 less than 10 acres. Only 16 of the farms had over 20 acres of corn.

There was an average of 9½ acres of bottom and well-lying land per farm, but more than a third of the operators had no such land and only about half of all the operators had as much as 5 acres of well-lying land.

The number of work animals averaged 1.1 head per farm. Forty-six of the 176 operators did not own a work animal, three owned one

work animal each, 43 owned two and only 8 owned more than two work animals each. There was an average of 1.7 milk cows per farm. One-tenth of the operators had no milk cows, about a third of the operators had one cow, and about a third of them two cows. Only 37 of the 176 operators had more than two cows.

One hundred and sixty-four of the 176 operators had one or more hogs. Only 76 operators had one or more brood sows. There was an average of 29 chickens per farm. Only two of the 176 families had more than 50 chickens, while 22 families had less than 10.

FARM RECEIPTS AND SPENDABLE INCOME

The meagerness of the incomes of these families is shown in Table 1. Because of the marked difference in the amount of level land and other resources, the 176 farms were divided into three groups consisting of 60 farms in the rough territory of the upper reaches of Stinking Creek, 55 farms in the lower Stinking Creek territory having better land resources and 61 other farms having for the most part land and other resources of an intermediate order. The gross receipts from crops and livestock averaged $58 per family which was little more than enough to pay current cash farm expenses without making allowance for any depreciation. Without the receipts from non-farming sources these families would have had practically no spendable income. The non-farming income

Table 1. Family receipts and spendable income for 176 farm operators on the Stinking Creek watershed, for the year ending April 1, 1933.

Item	Stinking Creek Watershed 176 farms	Upper Stinking Creek 60 farms	Lower Stinking Creek 55 farms	Other 61 farms
Receipts from crops	$ 17	$ 9	$ 30	$ 13
Receipts from livestock	41	28	72	25
All other receipts	53	35	80	47
Total receipts	$ 111	$ 72	$ 182	$ 85
Cash farm expenses	43	24	76	32
Net family income (spendable)	$ 68	$ 48	$ 106	$ 53
Family living from farm	147	117	194	133
Total family receipts	$ 215	$ 165	$ 300	$ 186
Total non-cash farm expenses	76	30	140	63
Family earnings	$ 139	$ 135	$ 160	$ 123
Number of persons in household	5.5	5.5	5.4	5.5

averaged $53 per family, more than a fourth of which came from work relief and direct relief.

The number of persons averaged 5½ per family and the net income available for spending averaged $68 per family. Twenty-four of the 176 farm operators had no spendable income after the current farm expenses were paid, 66 had from $1 to $50, 44 from $51 to $100, 28 from $101 to $150, and 14 had from $151 to $467. Adding to the $68 which was the average spendable income of the 176 families, the value of the things contributed by the farm to the family living gives total family receipts of $215. Subtracting from this item the non-cash items such as interest on the investment ($58), depreciation ($9) and decrease in feeds and supplies ($9) totaling ($76), leaves family earnings of $139 as an average for the 176 operators. The family earnings were less than $50 in a fifth of the cases, and less than $150 in two-thirds of the cases. In only one-fourth of the cases were the family earnings more than $200.

It is significant that the spendable income available for the 60 families living in the rugged upper Stinking Creek territory was $48 as compared with $106 for the families living in the more favorable lower Stinking Creek territory.

The total receipts averaged $111 for the 176 families. Of this total about half came from crops and livestock and about half from labor off the farm, store-keeping, school teaching, oil and gas leases, work relief and direct relief. Fifty-seven percent of the 176 operators received some aid from public relief agencies; 75 percent for the upper Stinking Creek group and 33 percent for the lower Stinking Creek group.

That the income per family in the lower Stinking Creek group was more than twice the amount for the upper Stinking Creek group is principally due to a larger income from crops and livestock in the former group. The chief crops sold were corn, sorghum, potatoes, and other garden products in the lower Stinking Creek group, while the chief sales for the upper Stinking Creek group were corn and potatoes. Poultry and dairy products, hogs and veal calves were the chief sources of livestock receipts for the lower Stinking Creek group, while poultry products and veal calves were the chief sources for the upper Stinking Creek group. The item "all other receipts" which included work relief, labor off the farm, income from oil and gas leases, etc., for the lower Stinking Creek group was

more than double the amount for the upper group. However, the receipts from work relief for the lower Stinking Creek group were less than half as great as for the upper group. Opportunities for part-time work off the farm for private employers were decidedly greater for the lower Stinking Creek group than for the upper group. The family spendable income is a significant measure of the results which farm operators are able to obtain from the resources at their command. As previously shown, the cash receipts derived directly from the farm were hardly sufficient to cover the cash farm expenses. In most cases, therefore, the ability of the family to have a cash income is largely dependent upon opportunities for acquiring income from non-farming sources. Such opportunities have been very greatly decreased since 1929. Furthermore, families that had previously moved away from this territory to engage in coal mining and other industrial occupations later returned because of the shutting down of the industries in which they had been employed. An important factor affecting opportunities for the sale of farm products raised in this territory, such as vegetables, poultry, eggs, milk and butter, was that the cessation or decline of opportunities for work in the local coal mines sharply reduced the buying power of these families during the period covered by this study.

FAMILY LIVING FURNISHED BY THE FARM

This study confirms the fact brought out in other studies made by the College of Agriculture in the Kentucky mountains that the well-being of families in this region is dependent in very large measure upon their producing an ample supply of foods for home use, especially poultry, dairy products and vegetables for summer use and storage for use after the growing season.

The value of the living furnished by the farm is shown in Table 2. The item averaged $147 for the 176 families, about 2½ times as much as the entire money income from crop and livestock sources. The value of family living furnished by the farm exceeded $150 for 74 of the 176 families and was less than $150 for 102 of the families. The money value of the use of the farm dwelling was put at 10 percent of the value of the dwelling and the item averaged $18 for the 176 families. The value of the dwelling house was less

than $100 in 78 of the 176 cases, less than $200 in 120 cases, and more than $200 in only 56 cases.

Table 2. Family living furnished by the farm.

Item	Values of			
	Food	Fuel	Use of dwelling	Total value
For families on Upper Stinking Creek	$ 107	$ 3	$ 7	$ 117
For families on Lower Stinking Creek	155	3	36	194
For all families	125	4	18	147

Food furnished by the farm for the family living averaged in value $125 for the 176 families[1]. The value of the item was less than $100 in 72 cases, $100 to $200 in 81 cases, and more than $200 in 23 cases. The item was 50 percent greater for the lower Stinking Creek families than for the upper Stinking Creek families.

Table 3. Farm expenses and family earnings for 176 farms, for the year ending April 1, 1933.

Item	Stinking Creek Watershed 176 farms	Upper Stinking Creek 60 farms	Lower Stinking Creek 55 farms	Other 61 farms
Depreciation	$ 9	$ 3	$ 17	$ 7
Decrease in feed and supplies	9	4	13	9
Interest on estimated value of investment	58	23	110	47
Total non-cash expenses	$ 76	$ 30	$ 140	$ 63
Current cash farm expenses	43	24	76	32
Farm expenses (total)	$ 119	$ 54	$ 216	$ 95
Average family earnings	$ 139	$ 135	$ 160	$ 123
Value of unpaid family labor other than the operator	$ 68	$ 48	$ 76	$ 79

FARM EXPENSES

The expenses incurred on the 176 farms are shown in Table 3. The chief cash farm expense items were taxes, hired labor, horse

1 Based upon the price of the same items of food in the year 1937 the total valuation would be about $250 or double the amount shown in table 2. The values used for the principal items of food furnished the family from the farm in the year 1932 were as follows:

Item	Unit	Value	Item	Unit	Value
Corn for bread	bushel	$0.50	Onions	bushel	$0.50
Corn (roasting ear)	dozen	.10	Cabbage	pound	.005
Potatoes	bushel	.50	Hens	each	.40
Sweetpotatoes	bushel	.50	Chickens (fryers)	each	.20
Turnips	bushel	.50	Hogs	pound	.04
Green beans	bushel	.50	Whole Milk	quart	.08
Apples	bushel	.50	Eggs	dozen	.09
Tomatoes	bushel	.50	Wood	cord	.25

shoeing, feeds and seeds. These totaled $43 as an average for the 176 operators, $76 for the lower Stinking Creek operators, and $24 for the upper Stinking Creek operators. The non-cash expense items for the 176 operators were $58 imputed as interest on the total investment in the farm, $9.00 depreciation on equipment, and $9.00 decrease in feed and supplies. Eighty-two of the 176 operators had cash farm expenses of less than $20 for the year. Forty operators had expenses ranging between $20 and $40, and 54 operators more than $40.

The value of the labor contributed by members of the farm family other than the operator averaged $68 for the 176 families.

LAND UTILIZATION

The two magisterial districts included in the land classification analysis comprise about a third of Knox County. Except for narrow bottoms along the river or main creeks, the land area in this territory is made up of steep hills. Ninety percent of the steep land has a slope of more than 25 degrees.

On a considerable acreage of this steep land, young trees, which in a few years would be large enough for saw timber, are constantly being destroyed to make way for corn patches. A few crops of corn on this land exhausts the limited amount of fresh organic matter and brings about erosion to the extent that the land will grow neither corn nor good timber. The re-cleared land in many cases is not sufficiently productive to yield more than 10 bushels of corn per acre in a normal season. Because of the steep and often rocky nature of the land only 1-horse plows can be used to break it and in a great many cases the entire cultivation must be done by hand. This means that the entire crop of one man is often limited to three to five acres, producing only 40 to 60 bushels for the entire area. This meager amount is much too small to furnish the family its quota of 25 bushels of meal for the year, and to feed a horse, a cow, 10 to 20 chickens and fatten a meat hog. Consequently the result is undernourishment for the family and few or no products to sell for cash with which to purchase clothing and other non-farm-produced necessities for the family.

Corn constituted approximately 68 percent of the acreage of all the land in harvested crops in the two magisterial districts making up the Stinking Creek area. Two-thirds of the corn is grown on

hillsides having slopes ranging from 10 to 40 degrees or more. The result of this type of cropping is that the hillsides have reached a stage of advanced erosion and very low productivity. The land in the upper reaches of Stinking Creek exemplifies particularly well the handicaps to which large numbers of farm families are subjected on rugged land thruout eastern Kentucky. The 60 farms in this group averaged only 39 acres in total area all of which except 2.4 acres were steep land very poorly adapted to the growing of corn, yet 21 percent of the total area of the hillside land was cultivated in corn (Table 4). In marked contrast the farms in the lower Stinking Creek area had eight times as much bottom land and only 3½ percent was cultivated in corn.

Table 4. Acreages and value of land and improvements per farm, Upper and Lower Stinking Creek. 1933.

Item	Upper Stinking Creek	Lower Stinking Creek
Number of farms	60	55
Average size of farm (acres)	39	92
Acres bottom land	2.4	20
Acres in crops	10.4	18.2
Acres in corn	8.3	11.5
Acres hillside corn	7.7	3.2
Value of dwellings	$ 70	$ 360
Value of land and improvements	471	2,186
Value of land and improvements per acre	12	40

Table 5 shows the labor requirements to produce corn on bottom land as contrasted with hillside land in the territory studied. The corn grown on the well-lying land was produced with 7.4 days of man labor per acre as compared with 16.2 days of labor per acre on the hill land. The average yield of corn on the well-lying land was considerably greater than that on the hill land. The corn on the bottom land yielded almost three times as many bushels per day of man labor as that on the hill land.

Table 5. Labor requirements to produce corn on bottom and hillside land, Stinking Creek. 1933.

Item	Bottom Land	Hillside Land
Number of farms	32	32
Total acres	237.5	504
Days man labor per acre	7.4	16.2
Bushels per acre	24.5	19.4
Bushels produced per day of man labor	3.3	1.2

A study of 28 fields on which crops were produced in 1932 indicates that most of the hillside land has been cleared only a short time and that it is capable of producing good yields for only a short period. Twenty-three hillside fields had been cleared or recleared for a period averaging five years. The range was one to 30 years. Usually after the second crop the fields lie out at least a year before being cropped again. It appears that an average of four cultivated crops may be expected from a field before it is allowed to grow up in brush or trees again.

The 23 hillside fields had an average slope of 31 degrees, the range in slope being from 18 to 55 degrees. The average area per field was 6.6 acres and the average yield of corn per acre was 21 bushels. Corn was the only crop produced on the 23 fields.

The five fields studied that were not on hillsides had slopes of three degrees or less. Three of these fields were in corn and two in soybeans. Two of the fields had been cleared for a period probably greater than 50 years and the other three 60, 60, and 50 years, respectively. The three fields in corn produced an average of 18 bushels per acre.

The study of the land use on the hillsides indicates a cycle of cropping, brush, and timber—that is, after the land is cleared, crops are produced for a few years, then brush is allowed to grow up and later develop into timber thus necessitating reclearing before the land can be cropped again. Cropping only was the characteristic practice on the bottom land. Having in mind that corn was the principal crop produced on both the hillside and bottom land a comparison was made of the total production of this crop during a cycle of hillside land use. Twenty-four years is probably an average length of cycle on the hillside land (Table 6). During this period an average of five crops of corn may be expected on land cleared for the first twenty-four year period and three crops on second clearing land for a similar period. Thus an average of four crops of corn may be expected on the hillside land. In the same number of years 12 crops of corn or other intertilled crop may be produced on the bottom land. Assuming average yields, the production of corn during the cycle on hillside land would average 77.6 bushels. Further assuming that soybean or cowpea hay is produced for two years of the four-year rotation on bottom land

and that the average yield per acre is 1½ tons, a total of 18 tons of hay would be produced during the 24 year period. Estimating the normal value of corn in this section at $1 per bushel and hay at $12 per ton the value of the total production per acre of corn and hay on the bottom land thru the 24 year period would be $495 or nearly $21 per year. At these same prices the total production per acre on the hillside land for the 24 year cycle would be $77.60 or a little over $3 per year. Thus for the bottom land almost four times this amount would be produced. The production of corn per 10-hour day of man labor would average 1.2 bushels for the hillside land and 3.3 for the bottom land.

Table 6. Cycles of land use on one acre of hillside and bottom land.

Year	Cycles of land use — 24 years		
	Hillside land		Bottom land
	1st clearing	2nd clearing	4-year-rotations
1	Corn	Corn	Corn
2	Corn	Idle	Corn
3	Idle	Corn	Hay
4	Corn	Idle	Hay[1]
5	Idle	Corn	Corn
6	Corn	Idle	Hay
7	Idle	Idle	Corn
8	Corn	Brush	Other crop
9	Idle	Brush	Corn
10	Brush	Brush	Corn
11	Brush	Brush	Hay
12	Brush	Brush	Hay
13 to 24	Growing timber	Growing timber	Same as above
Total corn acreage	4 acres (ave.)		12 acres
Estimated yield per acre	19.4 bus.		24.5 bus.
Total corn production	77.6 bus.		29.4 bus.
Total labor required	64.8 days		88.8 days
Production per day of man labor	1.2 bus.		3.3 bus.

1 Or other crop.

COST OF CLEARING LAND

Since only an average of four crops may be produced on a hillside field before it is allowed to go back to brush or trees, the labor and equipment necessary to clear or reclear an acre of land is an important item. Man labor is the principal item of cost in clearing land. The use of horse labor and any equipment other than a crosscut saw, axe and mattock is insignificant. The land is usually cleared in the late fall or early spring before time for plowing.

The man labor required per acre ranged from 5 to 25 ten-hour days.

The average man labor required for clearing 118 acres on 24 farms in the year 1933 was 10 days per acre. Since many fields used for corn are cleared, cropped a few years, then allowed to grow up in brush and later trees until cleared again, the labor for clearing land represents on the average a considerable proportion of the total labor necessary for producing corn on hillside land.

LAND CLASSIFICATION

A major purpose of this study of land utilization in Knox County was to determine the location and extent of areas of land adapted to more or less intensive use and to suggest plans for their best utilization and development.

At present most of the land in Magisterial Districts three and four of the county is owned by farmer operators. However, a considerable portion is owned by coal companies or speculators in mineral lands, particularly in District four. Altho there are no coal mining operations in these districts, except a small mine at Ely near the Cumberland River and scattered farm mines for local use, a large proportion of the farm owners have sold the right to mine coal on their farms. The coal right usually includes the right to use a limited area for operation of a mine and to use the timber on the farm for mining purposes[1]. A number of farm owners have leased or sold the oil rights to their land. Some of the oil leases have been cancelled or terminated[2].

BASIS OF LAND CLASSIFICATION

Many factors are related to the intensity of use to which land is adapted and are significant as bases of classifying it from the standpoint of the intensity of its use. The most important of these factors are present use, soil, topography, climate and distance to

1 The following is a typical paragraph included in the deed for sale of coal:
"Second party is granted necessary right-of-way on the surface of said land to mine and remove all said mineral, and room for tipples, entries, shafts, pits, tramways, roads and passageways, and also enough small unmerchantable timber from the surface of said land to supply the mines with caps, props, and with mine timbers."

2 A typical oil and gas lease specifies the acreage and length of lease and also includes the following:
"Lease for purpose of mining and operating for oil and gas, and of laying pipe lines and building tanks, stations, telephone, telegraph and electric power lines, houses for gates, meters and regulators with all other rights, privileges, appliances and structures necessary incident and convenient for the operation of this land alone and conjointly with neighboring lands."

market. The character of the soil influences the kind of crops grown, the quality of products raised, and the crop yield. Erosion is a serious problem where the slopes are steep. Topography as well as distance to market influences marketing costs. Climate in-

Figure 2. Magisterial districts three and four, showing land classes. Land Class I, 4,798 acres; land class II, 52,603 acres; land class III, 10,359 acres; total land area, 67,760 acres.

fluences the kind of crops grown, the quality of products and crop yields. The crops grown, crop yields, the quality of products produced and marketing costs have an important influence on farm incomes. The income from farming over a period of years influences every phase of life of the people of an agricultural area, in-

cluding their ability to keep their buildings and improvements in good condition and to provide by taxation desirable social services such as schools and roads.

The principal bases used in classifying the land in this study were topography, soil, the present use of the land and the condition of buildings. The land was divided into three classes according to the intensity of present and probable future uses (Figure 2).

LAND CLASSES

Land Class I includes a large proportion of woods and idle land (approximately 90 percent) and most of the farms have been abandoned. It is primarily adapted to forestry and recreational uses.

Land Class II includes land now largely in farms but unsuited to agricultural use. Many of the farms have been abandoned, but considerable farming is being done. The crops grown, the topography, the soil, extent of erosion, and the size and condition of buildings indicate that, in general, the land is better adapted to forestry or recreational use than farming. The woodland, brush, and idle land probably averages about sixty percent of the class.

Land Class III is fairly good agricultural land. As long as there is income from industry, such as lumbering and coal mining within the area, or from other sources, the well-lying land will probably continue to be used for subsistence and part-time farming.

METHOD OF CLASSIFYING THE LAND

The use of the land was determined by a land-use map covering all of Magisterial Districts three and four in Knox County. In preparing the land-use map, a United States Geological Survey Topographic map was photographed and ruled into squares of approximately 10 acres each (Figure 3). Field workers then went over the land and noted in each square the predominant use of the land as woodland, brush, corn, hay, pasture, or some other use.

If the land in a square was being used for more than one purpose, the area of each minor use was estimated by the enumerator and the estimate recorded in field notes. The relation of the 10-acre square to the streams, roads, and topographic features was used by the enumerator to determine location, distance and direc-

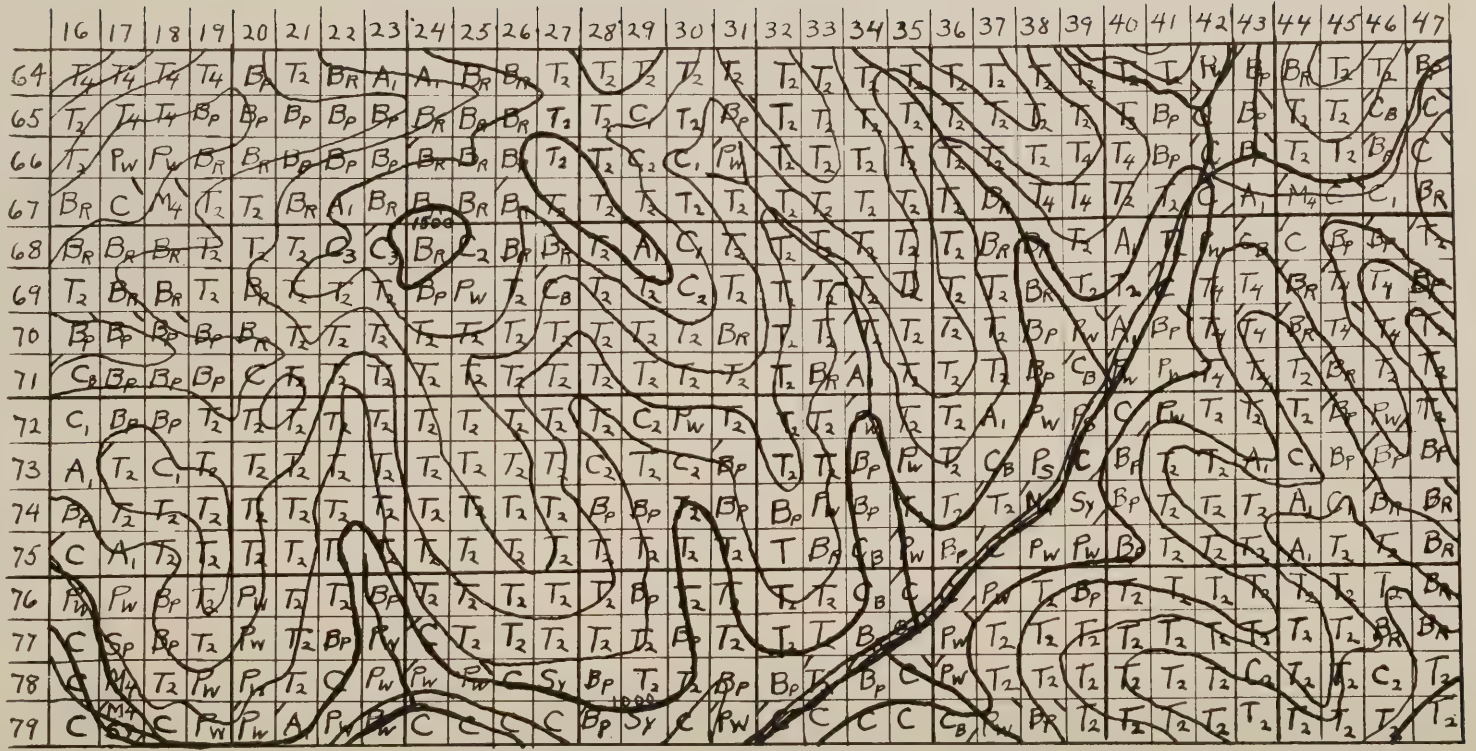

Figure 3. Section of Stinking Creek watershed cover map showing ten-acre squares. Contour lines and streams are shown as solid lines.

tion. Considerable pacing of distance was also done and estimates were often checked with farmers.

Symbols for the land cover are as follows:

A1—Cleared land idle one year.
As—Cleared land idle several years.
Bp—Brush land pastured.
Br—Brush land not pastured.
C —Corn on level land.
C1—Corn, first year clearing.
C2—Corn, second year clearing.
C3—Corn on stumpy land.
Ca—Corn on recleared land.
Cb—Corn on clean hillside land.
Dv—Rural residential area.
G —Garden or truck.
Iv—Land plowed but not cropped.
K —Rye for hay or pasture.
M2—Clover and clover and timothy.
M3—Timothy.
M4—Old meadow.
M5—Wild grass hay.
O —Orchard.
P —Seeded pasture.
Pw—Wild grass and weed pasture.
S —Potatoes.
T —Virgin timber.
T2—Cutover timber land.
T3—New growth timber on cleared land.
T4—Cutover timber land damaged by fire.
W —Wheat.

The condition of the farm houses including size and type of structure, was noted and each house located in the 10-acre square to which it belonged (Figure 4). The houses were classified into five groups according to condition: good, fair, poor, dilapidated, and unclassified.

USE OF LAND IN DIFFERENT CLASSES

The total area of Magisterial Districts 3 and 4 in Knox County is 67,760 acres. Of this total area, Class II comprised 52,603 acres

or nearly five-sixths of the total. The area of Class III land was 10,359 acres and of Class I land, 4,798 acres (Table 7).

Figure 4. Magisterial districts three and four, showing location of houses and land classes. There were no occupied houses in land Class I. In land Class II there were 10 occupied houses per 1,000 acres of land and in land Class III there were 29 occupied houses per 1,000 acres. The land in Class III included the unincorporated villages of Flat Lick and Himyar. The location of these villages is indicated by the rows of houses near the Cumberland River in the lower left-hand corner of the map.

There was a wide variation in the use of the land in the three land classes. In Class I for example 98 percent of the total area was in woodland (including brush land) and idle land as compared with 71 percent in Class II and 31 percent in Class III (Table 8). Approximately two percent of all the area in Land Class I was in pasture, 18 percent in Class II and 33 percent in Class

III. Corn and hay were the principal field crops. There was practically no corn in Class I, eight percent of the total area was in corn in Class II and 20 percent in Class III. Garden and miscellaneous crops amounted to 12 percent of the total area in Land Class III compared with one percent in Class II and practically none in Class I.

Table 7. Acres of land used for different purposes in each of three land classes, Stinking Creek watershed. 1933.

Use of land	Acres in land classes			
	I	II	III	Total
Woodland and idle*	4690	37367	3172	45229
Pasture†	83	9669	3404	13156
Hay	—	561	451	1012
Corn	24	4352	2094	6470
Garden and miscellaneous	1	654	1238	1893
Total all uses	4798	52603	10359	67760

* Woodland occupies more than three-fourths of this land on the average.
† Seeded pasture occupies only 20 acres of the total land in pasture.

The acreage by land classes for the uses designated as woodland and idle, total pasture, total hay, total corn, garden and miscellaneous in Table 7 is shown in Table 9. The acreage in woodland is approximately 91 percent of the total area in Land Class I, 54 percent in Class II and 18 percent in Class III.

Table 8. Percent of land used for different purposes in each of three land classes, Stinking Creek watershed. 1933.

Use of land	Percent in land classes			
	I	II	III	Total
Woodland and idle[1]	97.75	71.04	30.62	66.75
Pasture[2]	1.73	18.38	32.86	19.42
Hay	—	1.07	4.35	1.49
Corn	.50	8.27	20.22	9.55
Garden and miscellaneous	.02	1.24	11.95	2.79
Total all uses	100.00	100.00	100.00	100.00

1 Idle land occupies only 4 percent of the land; brush land, 13 percent.
2 Seeded pasture amounted to less than one-tenth of one percent of the land.

Most of the land used for pasture was brush in Classes I and II and about equally divided between brush and weed pasture in Class III. The hay harvested was principally old meadow (mostly redtop) in Class II and approximately equally divided between grass hay and soybeans and cow-peas in Class III.

The corn acreage was principally hillside corn in Land Classes I and II and bottom land corn in Class III. Garden and truck crops include home garden, truck and potato patches. The item "Miscellaneous" includes the villages of Flat Lick and Himyar, roads, railroads, orchards, oats, sorghum, and the portion of the area occupied by waste land and the Cumberland River.

Table 9. Acres of land used for different purposes in each of three land classes, Stinking Creek watershed. 1933.

Use of land	Acres in land classes			
	I	II	III	Total
Woodland	4,370	28,404	1,833	34,607
Brush land	280	7,668	629	8,577
Idle land	40	1,295	710	2,045
Total woods and idle	4,690	37,367	3,172	45,229
Brush pasture	67	6,557	1,616	8,240
Weed pasture	16	3,112	1,768	4,896
Seeded pasture	—	—	20	20
Total pasture	83	9,669	3,404	13,156
Soybeans and cowpeas	—	80	211	291
Clover	—	11	10	21
Timothy or redtop	—	57	35	92
Old meadow	—	330	165	495
Wild grass hay	—	83	30	113
Total hay	—	561	451	1,012
Hillside corn	24	3,612	529	4,165
Bottom land corn	—	740	1,565	2,305
Total corn	24	4,352	2,094	6,470
Garden and truck[1]	1	433	257	691
Miscellaneous[2]	—	221	981	1,202
Total garden, truck and misc.	1	654	1,238	1,893
TOTAL ALL USES	4,798	52,603	10,359	67,760

1 Includes garden, truck and potato patches.
2 Includes village of Flat Lick, roads, railroads, orchards, oats, sorghum and Cumberland River.

CONDITION OF FARM HOUSES

The condition of the farm house was one of the factors used in dividing the land of the Stinking Creek area into the three land classes. "Condition" refers to size and type of structure as well as the state of repair and age of the house. There were 304 houses

in Land Class III, 591 in Class II and two unoccupied houses in Class I. Since there were no occupied houses and only two unoccupied houses in Class I the analysis of housing data that follows includes only the houses in Land Classes II and III (Table 11).

Table 10. Acres of land used for different purposes in each of three land classes, Stinking Creek watershed. 1933.

Use of land	Acres in land classes			
	I	II	III	Total
Woodland	91.08	54.00	17.70	51.07
Brush land	5.84	14.58	6.07	12.66
Idle land	.83	2.46	6.85	3.02
Total woods and idle	97.75	71.04	30.62	66.75
Brush pasture	1.40	12.47	15.60	12.16
Weed pasture	.33	5.91	17.07	7.23
Seeded pasture	—	—	.19	.03
Total pasture	1.73	18.38	32.86	19.42
Soybeans and cowpeas	—	.15	2.04	.43
Clover	—	.02	.09	.03
Timothy or redtop	—	.11	.34	.13
Old meadow	—	.63	1.59	.73
Wild grass hay	—	.16	.29	.17
Total hay	—	1.07	4.35	1.49
Hillside corn	.50	6.87	5.11	6.15
Bottom land corn	—	1.40	15.11	3.40
Total corn	.50	8.27	20.22	9.55
Garden and truck[1]	.02	.82	2.48	1.02
Miscellaneous[2]	—	.42	9.47	1.77
Total garden, truck and misc.	.02	1.24	11.95	2.79
TOTAL ALL USES	100	100	100	100

1 Includes garden, truck and potato patches.
2 Includes village of Flat Lick, roads, railroads, orchards, oats, sorghum and Cumberland River.

Houses classified as good had at least three rooms, a fairly good coat of paint, stone or concrete block foundation, roof in good condition and in other ways had the appearance of being in good state of repair. The houses in this class were either frame, brick or stone (Figure 5).

Houses classified as fair had at least three rooms, tightly constructed, a substantial foundation and were in a fairly good state of

repair. These houses were usually of boxed construction with strips over the boxing, or of rough frame construction and unpainted. A number of the houses in this class were frame, brick or stone in a poor state of repair (Figure 6).

Table 11. Condition and use of houses in land classes II and III. 1933.

	Land class II Number		Land class III Number	
Occupied houses				
Condition of house				
Good	21		31	
Fair	118		108	
Poor	313		134	
Dilapidated	82		17	
Unclassified	12		7	
Total number occupied houses		546		297
Unoccupied houses				
Condition of house				
Good	0		0	
Fair	0		0	
Poor	14		1	
Dilapidated	28		6	
Unclassified	3		0	
Total number unoccupied houses		45		7
TOTAL all houses		591		304

Houses classified as poor usually consisted of only two rooms, with four windows or fewer and were in an average state of repair. Most of them were of boxed or log construction with rough stone or wood foundation and clap-board roof. The openings between the boards or logs were closed with strips or clay. A few were of frame or better type of construction but in poor or dilapidated condition due to age or want of care (Figure 7).

In the class of dilapidated houses many had only one or two rooms and were of log or rough boxed construction with nothing or only rough boards over the openings between the logs or rough boards. Many had no windows. A few were of stripped boxing or frame construction but because of age were included in this class (Figure 8).

In Land Class II, 23.5 percent of all houses were classified as good or fair and 45.7 in Class III (Table 12). None of the houses in good or fair condition in any land class were unoccupied.

In Land Class II, 66.9 percent of all houses were classified as poor or dilapidated occupied houses and 49.7 in Class III. The unoccupied houses classified as poor or dilapidated totaled 7.1 percent of all houses in Land Class II and 2.3 percent in Class III.

Figure 5. A typical farm house classed as good. Six percent of all the occupied houses in the area were in this class.

Figure 6. A typical farm house classed as fair. Twenty-seven percent of all the occupied houses in the area were in this class.

Figure 7. A typical farm house classed as poor. Fifty-three percent of all the occupied houses in the area were in this class.

Figure 8. A typical farm house classed as dilapidated. Twelve percent of all the occupied houses in the area were in this class.

The total of all houses classified as poor or dillapidated was 74 percent in Land Class II and 52 percent in Class III. In Land Class II, 2.5 percent of all houses were unclassified and 2.3 in Class III.

An analysis was made of the age, number of rooms, present and replacement value of 188 farm houses on the Stinking Creek watershed by condition of house. The houses classified as good were valued at almost four times as much as those classified as poor (Table 13), and the replacement value was more than double that of the houses classified as poor. The average age of the "fair" and "poor" houses was twice that of the "good" houses and the age of the "dilapidated" houses was nearly three times that of the "good"

houses. The houses classified as dilapidated had approximately one room less per house than those classified as good and fair.

Table 12. Percentage distribution of condition and use of houses in land classes II and III. 1933.

	Land class II		Land class III	
Occupied houses				
Condition of house				
Good	3.5		10.2	
Fair	20.0		35.5	
Poor	53.0		44.1	
Dilapidated	13.9		5.6	
Unclassified	2.0		2.3	
Total percent houses occupied		92.4		97.7
Unoccupied houses				
Condition of house				
Good	0.0		0.0	
Fair	0.0		0.0	
Poor	2.4		0.3	
Dilapidated	4.7		2.0	
Unclassified	0.5		0.0	
Total percent houses unoccupied		7.6		2.3
All Houses		100.0		100.0

A classification of the farm houses by type of construction revealed that approximately one-half of the 188 houses were of the box type. The average present value of the frame houses was approximately eight times the value of the log houses and more than three times the value of the boxed houses (Table 14). The average replacement value of the frame houses was more than eleven times that of the log houses and over three times the replacement value of the boxed type of houses. The average age of the frame houses was practically double the age of the log houses and

Table 13. Average age, size, present and replacement value of farm houses on the Stinking Creek watershed, by condition of house. 1933.

Condition of house	Number of houses	Present value of dwelling	Replacement value	Age in years	No. of rooms
Good	49	$ 342	$ 476	11.9	3.7
Fair	69	200	362	21.0	3.7
Poor	57	94	213	23.8	3.2
Dilapidated	13	18	107	34.5	2.8
Total	188	$ 192	$ 329	20.4	3.5

more than one and one-half times the age of the boxed houses. The facts of the study indicate a trend toward the construction of more boxed houses in recent years. This is probably due to the lower cost of construction for this type of house and the fact that the lumber needed for boxed houses was more readily available locally than the lumber needed for the frame type of construction. The average number of rooms in the frame houses was more than double the number in the log houses.

Table 14. Average age, size, present and replacement value of farm houses on the Stinking Creek watershed, by type of house. 1933.

Type of construction	Number of houses	Present value of dwelling	Replacement value	Age in years	No. of rooms
Log	16	$ 45	$ 54	13.9	1.9
Boxed	90	107	176	16.0	3.1
Frame	68	351	605	25.7	4.4
Other[1]	14	138	287	30.1	3.3
Total	188	$ 192	$ 329	20.4	3.5

1 Log houses with boxed or frame additions.

A classification of the houses by the number of rooms showed that almost one-third of them had only one or two rooms, and about half three or four rooms (Table 15). Forty-two of the 188 houses had five or more rooms.

Table 15. Average age, size, present and replacement value of farm houses on the Stinking Creek watershed, by size of house. 1933.

Number of rooms	Number of houses	Present value of dwelling	Replacement value of dwelling	Age in years
1	3	$ 26	$ 27	1.3
2	48	46	76	15.0
3	59	123	207	18.4
4	36	188	346	20.3
5	22	451	698	22.3
6 or more	20	496	902	40.2
Total	188	$ 192	$ 329	20.4

THE FARM FAMILY

A further analysis of the housing accommodations was made according to the age of the farm operator. About 28 percent of these families had one person or less per room, 35.6 percent had from 1.1 to 2 persons per room, 25 percent had from 2.1 to 3.0 persons per room and 11.7 percent had 3.1 or more persons per room

(Table 16.) The number of persons per room was about equally distributed among the different age groups except in the group of operators under 24 years of age and in the group over 54 years. Of the 13 operators less than 25 years of age, there were none with more than two persons per room. In the group of operators over 54 years of age, there were 51 families and only 11 of these families had more than two persons per room.

An analysis was made of the different locations where the 176 farm operators, whose farm business was analyzed, had lived. One hundred and seventy-two of the 176 reported their places of birth. Of this number 160 were born in Knox County and 12 outside the county.

Table 16. Number of persons per room in 180 houses on the Stinking Creek watershed. 1933.

Age of operator (years)	Number of houses	Persons per room			
		1 and less	1.1 to 2.0	2.1 to 3.0	3.0 and over
0 to 24	13	3	10	0	0
25 to 34	36	8	11	12	5
35 to 44	39	6	14	14	5
45 to 54	41	8	14	13	6
over 54	51	25	15	6	5
Total	180	50	64	45	21

OCCUPATIONAL EXPERIENCE OF FAMILY HEADS

One hundred twenty-nine, or 73 percent, of the 176 farm operators had worked off the farm and 48 percent of the 176 farm operators had left the farm as a place of abode, for work, since 1920.[1] Most of the operators worked in local mining centers or in northern industrial areas. The ratio of the operators who had worked off the farm to those who had never worked off the farm was about the same in each of the three sub-groups (Table 17.) Practically all those who had never lived and worked away from the farm had received income for other than farm work while living on the farm.

One hundred of the 176 farm operators received relief from the federal government in 1933. Seventy-five percent of this number had worked off the farm. Assuming that relief was being ad-

1 Operators receiving income from labor off the farm while living on the farm were not included.

Table 17. Number of farm operators on the Stinking Creek watershed who had worked off the farm. 1933.

Number of farm operators	Stinking Creek watershed 176 farms	Upper Stinking Creek 60 farms	Lower Stinking Creek 55 farms	Other 61 farms
Who had never worked off farm	47	15	14	18
Who had worked off farm	129	45	41	43
Who had worked off farm since 1920	84	31	27	26
Who received relief in 1933	100	45	18	37
Who had worked off farm and received relief in 1933	75	34	16	25

ministered in a rational manner in this area, it appears that the relief problem was largely caused by the "back-to-the-farm" movement from industrial centers, the decrease in income thru depletion of the merchantable timber, decrease in fertility of the land, failure of local industries employing farm labor and the large natural increase in population.[1] Continued depletion of the farm land and the remaining timber resources appears inevitable as long as this situation remains. If these conditions continue, and if employment or relief are not provided, poverty and squalor may be expected for many years to come (Figures 9 to 12.)

MIGRATION FROM KNOX COUNTY

In addition to the movement away from the farm and a subsequent return as enumerated in Table 17, a considerable number have moved away and remained away. Calculations made from the data on population of the U. S. Census and the U. S. Division of Vital Statistics show the amount of migration that took place during the 20-year period, 1910 to 1930. The net migration[2] from Knox County for the period, 1910 to 1920, was estimated at 5300 persons or approximately 24 percent of the 1910 population. For the period, 1920 to 1930, the net migration was estimated at 3800

1 The index of natural increase for the rural farm population of Knox County was 193 in the year 1930. The index of natural increase is the number of children under five years of age expressed as a percentage of the number necessary to maintain a stationary population, assuming no changes in population due to migration. The index of natural increase for the rural farm population of the U. S. is 148. An index of 100 is necessary to maintain a stationary rural farm population assuming no migration.

2 Net migration is the number of people moving out of the county minus the number of people moving into the county during the same period of time.

persons, or approximately 16 percent of the 1920 population.[1] The larger net migration out of the county before 1920 was principally due to the rapid expansion of coal mining developments in neigh-

Figure 9. Destroying the potential cash crop to grow the subsistence crop (corn). Knox County, 1933.

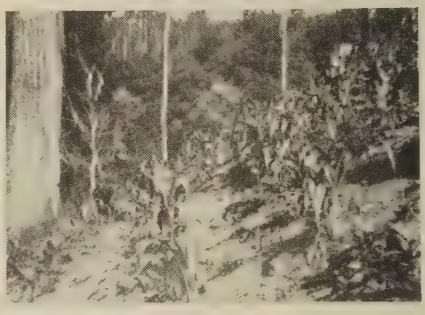

Figure 10. The two principal competing crops on hillside land. Trees are the potential cash crop. Corn is the subsistence crop. Knox County, 1933.

Figure 11. Plowing the "old field" for corn. A day of man labor produces a bushel of corn on hillside land. Knox County, 1933.

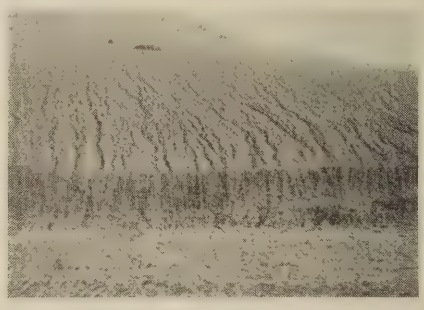

Figure 12. The "old field" erodes severely after the second crop. Hillside land Knox County, 1933.

boring counties, particularly in Harlan County. A large proportion of those who left Knox County, especially the young people, moved out of the area and in many instances out of the state.[2]

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1 The calculations for migration during the period, 1920 to 1930, were obtained from the "Study of Population Redistribution" made by Dr. C. W. Thornthwaite.

2 The number of sons and married daughters living away from home in 1928 was obtained for 203 farm families in Laurel County, an adjacent county to Knox County. The number of sons and married daughters away was 178 and 175, respectively, a total of 353. Their locations by areas were Laurel Co. 42.8 percent, another state 29.2, outside Laurel Co. in Mountain Area 14.7, an delsewhere in Kentucky 13.3 percent. A larger percentage of married daughters were living in Laurel Co. than the sons and a larger percentage of the sons were in another state than the married daughters. The occupation of the sons away from home were farmers 28.8 percent, laborers 24.3, professional services 17, tradesmen 12.4, public service 11.3, and merchant or dealer 6.2 percent. The occupations of the husbands of married daughters were farmers 54.7 percent, laborers 23.5, public service 10, tradesmen 5.3, professional services 4.7 and merchant or dealer 1.8 percent. U. S. Department of Agriculture Technical Bulletin No. 289.

According to the U. S. Census of 1930, the total population of Magisterial District No. 3 was 2851 persons and that of District No. 4, 1924 on April 1, 1930, a total of 4775 for the two districts (Table 18). This was 63 persons per square mile in District No. 3 and 33 per square mile in District 4. The unincorporated villages of Flat Lick and Himyar are located in District 3. The rural farm

Table 18. Population by sex and color in Magisterial Districts[1] 3 and 4 and in Knox County.[2]

Area	Total population	Sex		Color	
		Male	Female	White	Negro
District 3	2,851	1,501	1,350	2,717	134
District 4	1,924	1,003	921	1,924	0
Knox County	26,266	13,414	12,852	25,671	595

1 Districts 3 and 4 constitute the Stinking Creek watershed.
2 U. S. Census, 1930.

population[1] was 1934 in District 3, or 43 persons per square mile. District No. 4 includes the larger part of the rough Upper Stinking Creek Area with the entire population classed as rural farm. According to the U. S. Census of 1935 the rural farm population in the two magisterial districts increased 21 percent during the five-year period from 1930 to 1935. Approximately one-third of the increase was due to the return to the area from mining and industrial centers.

The greater part of the land in Eastern Kentucky unsuited to agriculture is adapted either to forestry or recreational purposes or both. Land suited to forestry would yield not only timber but also indirect advantages in the form of opportunities for hunting, fishing and other recreational privileges. Forestation would also improve the appearance of the country side, and be helpful in the protection of streams, the control of floods and the prevention of soil erosion.

On account of the long period between the planting of trees and harvesting of forest products, the enterprise should be handled on a large scale as a corporate, state or national project. This is true particularly of large contiguous areas which are unsuited to agricultural use. There is probably very little land in Eastern Kentucky that cannot be put to some useful purpose. A rational

1 Rural farm population means people living on farms in rural territory.

program for the use of land in this area should include the forestation and reforestation of land adapted primarily to forest use.

In regions where conditions are similar to those in the Upper Stinking Creek Area, very little money is available for new buildings or repairs to present buildings. If no new capital is brought into such areas, the depreciation of present improvements will eventually force the complete abandonment of most farms or a sinking of the people to greater depths of poverty. In such areas if schools and roads are furnished, they must be paid for with taxes collected elsewhere. Farm fire insurance companies must charge higher rates to clients elsewhere if insurance is to be furnished in such areas as this and losses incurred by agencies lending money to farmers must be borne by borrowers on more productive land.

ANALYSIS OF TWO REPRESENTATIVE AREAS OF WELL-LYING LAND

In addition to the analysis of the land resources in the two magisterial districts constituting the Stinking Creek watershed, a land-use analysis was made for two representative areas in Knox County having more well-lying land than the average for the Stinking Creek area. These two areas are located in the Cumberland River valley and in the valley of Big Richland Creek, a tributary of Cumberland River, an aggregate of about 18,000 acres. This phase of the study was intended to throw light on the possibilities of such land for furnishing a living for its operators and especially its possibilities for affording resettlement opportunities for families living on the rough lands of this and other eastern Kentucky Counties.

Big Richland Creek Valley Area. This area consisted of a block of 14906 acres along Big Richland Creek, constituting all the land of 165 contiguous farms, being practically all the farms on that creek. The acreage owned per farm averaged 90 acres, ranging from 3 to 300 acres. The number of farms less than 50 acres was 37, from 50 to 99 acres 65, from 100 to 149 acres 34, from 150 to 199 acres 14, and from 200 to 300 acres 15 farms. The analysis showed that 2556 acres or only 17 percent of this acreage consisted of level land. Of this, 2272 acres was bottom land and 284 acres

level upland.[1] Twelve thousand three hundred forty-two acres, or 83 percent, of all the land in these farms was hillside land. Of this, 11,463 acres or 93 percent was steeper than 10 degrees.

As a ten-year average the yield of corn on the bottom land was 24 bushels per acre, on the level upland, 22 bushels, on the hillside land of less than 10 degrees slope, 20 bushels, and on hillsides steeper than 10 degrees, 16 bushels. The steep hillside land was cropped mostly in corn in a much longer rotation than the level or rolling land. The 165 farms averaged 90.3 acres total area, 13.75 acres bottom land, 1.75 acres level upland, 69.5 acres of land steeper than 10 degrees and 5.3 acres of hillside land of less than 10 degrees slope.

For the 165 farms in the area studied, 1046 acres or 41.6 percent of the bottom land is in need of drainage (Table 19). The average farm in the area has nearly 14 acres of bottom land and 6.3 acres of this is in need of drainage. The acreage of bottom land per farm for the 55 farms on Lower Stinking Creek averaged 20 acres. About nine-tenths of the land needing drainage is cleared and two-thirds was in crops in 1933. Some of the land not cropped is so wet under present conditions that it is not worth while to try to raise crops, while some of it is in pasture grasses and can be grazed during the summer. Some pasturage can also be had during the summer from a portion of the uncleared land. The productivity of most of this land would be greatly increased by adequate drainage. Usually satisfactory drainage program should include a number of farms.

In Table 19, the farms in the Big Richland area are grouped according to the amounts of bottom land on the farm. It should be noted that as the amount of bottom land increases, the percent that needs drainage increases materially. No doubt this is partly because farms with small amounts of bottom land are often located higher up on the creek and on its tributaries, where the valley is narrower and hence less likely to need drainage, while farms with larger amounts of bottom land are nearer the mouth of the stream where the valley is wider and more nearly level and where the current is slow and the stream bed meanders. It is also partly because, with a larger amount of bottom land, the farmer finds it less urgent

1 Level upland, in this bulletin, is all upland that can be planted in row crops and plowed both ways without causing serious erosion. Usually this land has a slope of three degrees or less.

to make the best use of all his bottom land and is therefore less interested in spending the time and money necessary to do the needed draining. It should be noted however, that very little concerted effort had been made to drain the bottom land in this area up to the time of the study. Individual farmers had done some work on their own farms when the main stream bed was deep enough and near enough to take the water off.

Table 19. Relation of bottom land per farm to the amount of land needing drainage, Big Richland Area. 1933.

Bottom land per farm		Number of farms	Percent of bottom land needing drainage	Average width of bottom land (yards)
Range Acres	Average Acres			
0 to 9.9	4.3	90	35.6	49
10 to 19.9	13.1	36	35.9	139
20 to 29.9	23.3	17	55.4	239
30 to 39.9	32.7	8	44.1	86
40 and over	53.6	14	55.0	256
All farms	13.7	165	46.2	136
0 to 19.0	6.8	126	36	108
20 and over	36.1	39	52	207

In Table 20 is shown the relation of the amount of bottom land per farm to the amount of land per farm needing drainage and the degree of development of the land needing drainage. On the whole, as the amount of bottom land per farm increased, the land needing drainage, both cleared and not cleared, increased. Farms with less than 20 acres of bottom land had only 1.5 percent of bottom land

Table 20. Relation of the amount of bottom land per farm to the use made of land needing drainage, Big Richland Area. 1933.

Bottom land per farm		Number of farms	Percent of bottom land needing drainage	
Range Acres	Average Acres		Not cleared	Cleared
0 to 9.9	4.3	90	1.3	34
10 to 19.9	13.1	36	1.7	34
20 to 29.9	23.3	17	2.9	53
30 to 39.9	32.7	8	4.4	40
40 and over	53.6	14	5.6	49
All farms	13.7	165	3.3	43
0 to 19.9	6.8	126	1.5	34
20 and over	36.1	39	4.4	48

not cleared and needing drainage, and 34 percent of bottom land cleared and needing drainage, while farms with 20 acres or more of bottom land had 4.4 percent of bottom land not cleared and needing drainage, and 48 percent of bottom land cleared and needing drainage. Approximately three-fourths of the 165 farms had less than 20 acres of bottom land, and more than half had less than 10 acres per farm.

On the 165 farms studied in the Big Richland area there were 266 acres of corn on land which is usually overflowed in summer. In taking the schedule, the farmer was asked in each case, how many total crop failures were experienced in 10 crops? The weighted average number of total crop failures experienced out of 10 crops as a result of drowning was 1.87 for the 266 acres. For the land in corn in 1933, the expected average annual loss amounts to 1,074 bushels or 4 bushels for each acre planted.

A total crop failure on land which is flooded in winter only is rare and consequently the average annual loss due to crop failure is negligible. It should be recognized, however, that the winter flooding prevents the production of all crops except spring-planted ones such as corn, sorghum, cowpeas, soybeans, etc.

Table 21 shows for each of the six grades of land in the Big Richland area the average of estimated yields of corn over a period of years, the average of the estimated highest yields commonly obtained in the area, the average number of total crop failures out of 10 crops, and the number of acres involved in these averages.

Table 21. Corn. Average yield and crop failure on various grades of land, Big Richland Area. 1933.

Grade of land	Acres involved	Total crop failure in 10 years	Average yield	High yield
			Bushels	Bushels
Bottom, level				
Summer overflow	266.25	1.87	17.6	37.2
Winter overflow only	96.25	0	27.8	35.1
Never overflowed	321.0	0	23.7	31.1
Upland, level	36.0	0	21.4	30.6
Hillside, 3° to 10° slope	219.0	0	19.0	26.7
Hillside, over 10° slope	1,575.75	0	15.7	23.7

It appears that farmers who have 20 acres or more of bottom land little of which needs draining, make about as good use of

their hill land as those who have less than 20 acres of bottom land much of which needs draining.

The average amount of land per farm, by types and ultilization, for 54 farms on the lower part of Big Richland Creek, is shown in Table 22. Almost one-third of the total acreage per farm was in crops in 1933. However, 67 percent of the bottom land was in crops as compared with 19 percent of the steep upland; 27 percent of the bottom land was in pasture or idle and 28 percent of the steep upland; six percent of the bottom land was in woods and 52 percent of the steep upland.

Table 22. Average amount of land per farm by types and use, 54 farms, Big Richland Area. 1933.

Land types	Total acres per farm	Acres in crops (Incl. garden)	Acres cleared, not cropped		Acres not cleared
			Pasture	Idle	
Bottom land	16.5	11.1	2.2	2.2	1.0
Upland level	1.8	0.5	0.3	0.1	0.9
Upland rolling	4.7	1.8	0.9	0.6	1.4
Steep upland	52.9	10.2	12.2	2.9	27.6
Total	75.9	23.6	15.6	5.8	30.9

The principal crops grown on the 54 Lower Big Richland Creek farms are shown in Table 23, by type of land. More than 84 percent of the acreage in crops was corn and hay (including soybeans). Most of the corn was produced on the steep upland while practically all the hay was produced on the level bottom land. The soybean hay was produced on the bottom land subject to overflow.

Table 23. Crop acres per farm, including garden, by land types, for 54 farms, Big Richland Area. 1933.

Land types	Crop acreage							
	Corn	Meadow	Soybeans	Potatoes	Tobacco	Cane	Other	Total
Bottom land	4.1	4.0	1.7	0.2	0.1	0.3	0.7	11.1
Upland level	0.2	0.1	.0	.0	.0	.0	0.2	0.5
Upland rolling	1.1	0.1	.0	0.1	0.1	.0	0.4	1.8
Steep upland	8.5	.0	0.1	0.1	0.1	0.1	1.3	10.2
Total	13.9	4.2	1.8	0.4	0.3	0.4	2.6	23.6

Cumberland River Valley Area. This area of 3089 acres comprised all the land of 42 contiguous farms bordering the Cumberland River. The acreage owned per farm averaged 74 acres, rang-

ing from 9 to 467 acres. The number of farms smaller than 50 acres was 16, from 50 to 99 acres 17, and with 100 or more acres 9 farms. Only one farm consisted of more than 150 acres. Of the 3089 acres, 1444 acres, or 47 percent, was level land, 1018 acres being bottom land and 426 acres level upland.[1] One thousand six hundred forty-five acres, or 53 percent, of all the land in these farms was hillside land, 1334 acres or 81 percent of which was steeper than 10 degrees.

As a 10 year average the yield of corn on the bottom land was 30 bushels per acre, on the level upland 15 bushels, on the hillside land of less than 10 degrees slope 12 bushels, and on hillsides steeper than 10 degrees 20 bushels. The 42 farms averaged 73.5 acres total area, 24.25 acres bottom land, 10 acres level upland, 31.75 acres of land steeper than 10 degrees, and 7.5 acres of hillside land of less than 10 degrees slope. Because of the necessity for retarding erosion and loss of fertility, a longer rotation was used for corn on the steeper hillside land than on that which did not slope more than 10 degrees.

Table 24. Relation of bottom land per farm to the amount of land needing drainage, Cumberland River Area. 1933.

Bottom land per farm		Number of farms	Percent of bottom land needing drainage	Average width of bottom land (yards)
Range Acres	Average Acres			
0 to 9.9	2.8	7	14.3	50
10 to 19.9	14.3	9	11.9	402
20 to 29.9	22.4	13	20.5	345
30 to 39.9	34.6	7	17.3	257
40 and over	56.3	6	26.6	467
All farms	24.25	42	21.7	276
0 to 19.9	9.2	16	12.0	290
20 and over	33.5	26	22.1	268

On the 42 farms in the Cumberland River Area, 1018 acres are bottom land, of which 221 acres, or 21.7 percent, need draining (Table 24). The average farm in the area with 24.25 acres of bottom land has 5.25 acres in need of drainage. About 82 percent of the land needing drainage is cleared but only 31.3 percent was in crops in 1933. Some of the poorly drained cleared land not cropped is used to very good advantage for pasture. Some oper-

1 See footnote Page 189.

ators expressed themselves as not wanting the land drained since it affords superior grazing as it is.

In Table 24, the farms in the Cumberland River Area are grouped according to the amount of bottom land on the farm. There appears to be a tendency also in this area for farms with larger amounts of bottom land to have a larger proportion in need of drainage. Sixteen, or approximately two-fifths, of the 42 farms had less than 20 acres of bottom land. On the average a much smaller percent of the bottom land in the Cumberland River Area needed draining than in the Big Richland Area. However, the problem of draining the Cumberland River Area is much greater than in the Big Richland Area since most of this land is subject to overflow by the Cumberland River.

In Table 25, the farms in the Cumberland River Area, grouped according to the amount of bottom land on the farm and the percentages of the bottom land in need of drainage, both cleared and not cleared, are shown. A very small proportion of the land needing drainage is not cleared and much of this has been cleared and has since been allowed to grow up in willows, swamp elder and other bushes.

Table 25. Relation of the amount of bottom land per farm to the use made of land needing drainage, Cumberland River Area. 1933.

Bottom land per farm		Number of farms	Percent of bottom land needing drainage	
Range Acres	Average Acres		Cleared	Not cleared
0 to 9.9	2.8	7	14.3	0.
10 to 19.9	14.3	9	10.3	1.6
20 to 29.9	22.4	13	12.6	7.9
30 to 39.9	34.9	7	17.3	0.
40 and over	56.3	6	22.5	4.1
All farms	24.25	42	16.8	3.8
0 to 19.9	9.2	16	11.0	1.0
20 and over	33.5	26	17.8	4.2

On the 42 farms studied in the Cumberland River Area, there were 87 acres of corn on land which commonly is overflowed in summer. As in the Big Richland Area, the farmers were asked for an estimate of the number of total crop failures experienced in growing 10 crops on the land. According to these estimates, two complete failures can be expected out of 10 crops, on the average.

For the land in corn in 1933, the average annual expected loss amounts to 532 bushels, or 6.1 bushels for each acre planted. Thus the annual expected loss per acre is greater in this area than in the Big Richland Area.

A total crop failure on land which is overflowed in winter only does not occur nearly so often and consequently the average annual loss due to crop failure is much less, averaging less than one-half bushel per acre for the land in corn in 1933. The average loss was only .08 crops out of 10 crops on this land. Corn is the principal crop grown on the winter-overflow land, however, since the winter overflows prevent the production of other crops.

Table 26 shows for each of the six grades of land in the Cumberland River Area an average estimated yield of corn over a period of 10 years, the average of the highest estimated yields commonly obtained in the area, the average number of total crop failure out of 10 crops, and the number of acres involved in these averages. It will be noted that during favorable seasons the low bottom land which is subject to summer overflow produces better yields than the higher land which is overflowed in winter only, but that as an average the higher land produces over four bushels more per acre.

Table 26. Corn. Average yield and crop failure on various grades of land, Cumberland River Area. 1933.

Grade of land	Acres involved	Total crop failure in 10 years	Average yield	High yield
			Bushels	Bushels
Summer overflow	87.0	2.0	25.0	45.7
Winter overflow only	283.25	.08	29.25	37.3
Never overflowed	41.5	0	17.1	25.7
Upland level	83.25	0	15.0	21.0
Hillside, 3° to 10° slope	86.5	0	11.8	15.8
Hillside, over 10° slope	93.0	0	19.6	24.6

In neither of the two areas studied was there evidence that farmers make greater use of hill land when they have only a small amount of bottom land than when they have larger acreages of bottom land. This apparently was equally true when the characters of the bottom land is taken into consideration. This is probably due to the relatively low productivity per acre of the hillside land and the greater amount of man labor required. Possibilities for employment off the farm over a period of years

are greater in this area than on Upper Stinking Creek and therefore there is less need for clearing the hillside land even tho a smaller acreage of bottom land is available for cropping.

RELATION OF CROP LAND PER FARM AND RELIEF PER FAMILY

The income from relief during the year, August 1, 1932, to July 31, 1933, averaged $19.89 per family for 133 families on which the data were obtained in the Big Richland Area. It will be noted in Table 27 that there is a close inverse relationship between the number of acres of crops per farm and the income received by the farm family from relief sources. The average receipts from relief fall off rapidly as the acres of crops increase. Farm families having less than twenty acres of crops received an average of $30.55 per family from relief while those with twenty acres or more of crops received an average of $6.10 from relief funds.

Table 27. Relation of income from relief to total acres of land in crops, Big Richland Area. 1933.

		Acres bottom land		Number of farms and average income from relief		
Acres in crops	Number of farms	Total	Average per farm	Number	Income	Average per farm
Less than 20 acres	90	767	8.5	75	$ 2,291	$ 30.55
20 to 39.9	53	678	12.8	39	245	6.28
40 and over	22	820	37.3	19	109	5.74
All farms	165	2,265	13.7	133	$ 2,645	$ 19.89

In the Cumberland River Area the income from relief averaged $10.44 for each of the 36 families on which data were obtained (Table 28). Here again the receipts from relief sources varied inversely with the amount of land in crops. On farms

Table 28. Relation of income from relief to total acres of land in crops. Cumberland River Area. 1933.

		Acres bottom land		Number of farms and average income from relief		
Acres in crops	Number of farms	Total	Average per farm	Number	Income	Average per farm
Less than 20 acres	17	203	11.9	15	$ 376	$ 25.07
20 to 39.9	17	484	28.5	14	0	0
40 and over	8	332	41.5	7	0	0
All farms	42	1,019	24.2	36	$ 376	$ 10.44

with 20 acres or less of crops the families received an average of $25.07 from relief sources while families on farms with 20 acres or more in crops received no relief funds during the year, August 1, 1932, to July 31, 1933.

While it is recognized that the number of acres of crops grown by the families in 1933 had very little direct influence on the need for relief during the year 1932-1933, the amount of crops grown in 1933 is a very reliable indication of the amount grown in 1932 which was the source of livelihood during the period August 1, 1932, to July 31, 1933. Since the crops grown in 1933 do not in every case correspond to those grown by the family in 1932 and since the amount of relief is not always an infallible measure of the need for assistance, a perfect correlation between these two factors would not be expected. It should be noted that the acreage of bottom land increased as the acreage of crops increased in the two areas. Thus it is evident that the need for relief diminishes very greatly for farms having 20 or more acres of crops provided about three-fourths of this acreage is productive level land.

The relationship between the acreage of crops and level land to the amount of relief for the farm operators in the Lower Stinking Creek group was similar to that in the Big Richland and Cumberland River areas. The amount of relief in the lower Stinking Creek area was much greater for the farmers averaging less than 20 acres of bottom land than for those with 20 acres or more. It should be noted, however, that the farm operators on Lower Stinking Creek averaging more than 20 acres of bottom land also had receipts from sources other than the farm averaging $80 per farm, such as labor off the farm, oil and gas leases, storekeeping and teaching. Altho no information is available for the Big Richland and Cumberland River areas, in regard to outside income, it is very probable that these farmers received a portion of their income from sources other than the farm. It should not be assumed, therefore, that farmers with 20 acres of level land available for crops each year can be wholly self-supporting with income only from the farm.

The 165 farms in the Big Richland Creek Area averaged 90 acres, with 102 of these farms having less than 100 acres. The bottom land and level upland averaged 15½ acres per farm, with

an average of 46 percent of the bottom land needing drainage. Only 39 or less than one-fourth of all the farms had more than 20 acres of bottom land. Based upon the analysis of the 60 farms on Lower Stinking Creek and the relation of crop acreage and bottom land to the amount of relief in the Big Richland Area the situation in regard to the land resources on Big Richland Creek indicates that more than three-fourths of the 165 farms have insufficient land for farming of the more successful type. From the Stinking Creek study it appears that a fairly satisfactory unit of land is 20 or more acres of level land suitable for cropping. Thus it may be stated that only one-fourth of the farms on Big Richland Creek have sufficient land, if it is assumed that there is enough level land on these farms to compensate for the bottom land that it is not practicable to drain. Furthermore the drainage necessary for one-half of the bottom land on these farms, before the land can be satisfactorily cropped, is a common problem to all the owners and should be approached on a co-operative or area basis. The cost of drainage for this land would depend largely upon local wage rates since it probably can best be accomplished by the use of man labor as the principal item of cost. The profitableness of the drainage enterprise if attempted on an acreage assessment basis would depend largely upon the local demand for the products that can be produced on the drained land. It is apparent that there is at present a surplus farm population on the well-lying land on this creek, and that any program of relocation of families from the more rugged sections of the county such as the Upper Stinking Creek area would further aggravate the situation unless such families replaced a larger number who desire to relocate somewhere outside the area.

The 42 farms in the Cumberland River area averaged 74 acres per farm, with an average of 19 acres of well-drained bottom land. Thus it would appear that there are adequate land resources on the river bottom lands for the people living there at present, assuming that approximately 20 acres of level land is necessary for farming of the more successful type as indicated by the analysis of the data of the Lower Stinking Creek area. However, the river bottom lands offer opportunity for the resettlement of families from other land only to the extent that the incoming families displace the present occupants.

PROFITABLE SYSTEMS OF FARMING FOR THE AREA

What possibilities are there for farm families in the area for making a satisfactory living on their farms when they make reasonably good use of their available resources? As a partial answer to this problem, suggested systems of farming which appear to fit local conditions are presented in the form of farm budgets or detailed plans for the use of the farmers' resources. In the preparation of these budgets an effort has been made to secure the greatest possible use of the available land, capital, and labor resources. Particular consideration has been given the long-time point of view in the use of farm land. Intensive use is made of the available level land while the steep land is largely kept in pasture or trees.

In order to calculate the income which can reasonably be expected from a farm in the area, certain basic information is needed. For instance, in calculating the probable total production of crops (Table 32, Section B) when they are produced with good cultural practices, one must know what yields can be reasonably expected from the various farm crops produced within the area when good cultural practices are used. In order to calculate the seed, fertilizer, spray material and other items of cost which are needed in producing these crops (Table 32, Section C) one must know how much of the various cost items will be required for each acre of the several crops to be produced. These two types of information, for crops commonly grown in the area, are shown in Table 29.

On the other hand, if one is to calculate the probable production of livestock to be kept on the farm (Table 32, Section E) he must know the average annual production which can be anticipated if good feeding and breeding practices are followed. In order to calculate the total feeds and other materials needed to produce a given amount of livestock and livestock products (Table 32, Section D) one must know how much of these feeds and other cost items are required per unit of the various classes of livestock kept in the community. These two kinds of information for the classes of livestock commonly produced in the area are shown in Table 30.

Before one can add up the results of crop production and livestock production and bring the results together as a net return to the farm which can be easily compared with other farms one must apply prices to the crop products and the livestock products as well as to the seeds, fertilizer, feeds, other supplies and labor needed in carrying on the business. Relative prices for the common farm products and farm expense items are presented in Table 31. It should be noted that these are not intended as price predictions for any particular period but are presented primarily to emphasize the necessity for assigning values to the items to be bought and products to be sold in order to decide upon the possibility of an enterprise and in order to arrive at the probable financial returns for a given type of organization in a given farm situation. While these prices have been determined after a careful study of the prices that have prevailed in the section in recent years in so far as they are available and every effort has been made to secure comparability thruout the series, it will be necessary at any given time for farmers to make their own assumptions as to the prices that will be applicable to conditions on their own farms.

Table 29. Expected normal production requirements for crops and expected normal yields per acre.[1]

Crop	Requirements		Yield	
	Kind	Amount	Kind	Amount
Tobacco (Burley)	Seed, ozs.	.1	Tobacco leaf (all grades)	700 lbs.
	Fertilizer, 4-12-8, lbs.	350		
	Wood, bed, loads	3		
	Tobacco canvas, yds.	50		
Potatoes	Seed, bus.	13	Potatoes (1st grade)	100 bus.
	Fertilizer, 4-8-6, lbs.	400		
	Lead arsenate, lbs.	8		
Tomatoes (Canning)	Seed, ozs.	2	Ripe tomatoes	160 bus.
	Superphosphate, 20%, lbs.	300		
	Tobacco canvas, yds.	20		
Corn[2] (cut and shocked)	Seed, lbs.	7	Grain	40 bus.
	Superphosphate, 20%, lbs.	150	Stover	2,500 lbs.
	Twine, lbs.	.5		
Soybeans or cowpea hay	Seed, bus.	1.5	Hay	2 tons
	Superphosphate, 20%, lbs.	200		
Sorghum	Seed, lbs.	6	Syrup	100 gals.
	Superphosphate, 20%, lbs.	150	or	
	Wood for evaporating, loads	1	Fodder	4 tons
	Buckets, number	100		
Wheat	Seed, bus.	1.25	Grain	12 bus.
	Superphosphate, 20%, lbs.	250	Straw	1,300 lbs.
	Twine, lbs.	2	or	
	Threshing, @ 10c, dollars	1.2	Hay	1,800 lbs.
Oats, hay or grain	Seed, bus.	2.5	Hay, or	1.25 tons
	Superphosphate, 20%, lbs.	250	Grain	25.0 bus.
Rye (Nurse crop, pasture & hay)	Seed, bus.	1.5	Pasture	—
	Superphosphate, 20%, lbs.	300	Hay	1.0 tons
Mixed clover hay and pasture	Limestone, tons	2	Hay	1.5 tons
	Seed: Adapted red clover, lbs.	5		
	Alsike clover, lbs.	1		
	Korean lespedeza, lbs.	5		
	Timothy, lbs.	5		
Pasture mixture	Limestone, tons	1	Pasture	—
	Superphosphate, 20%, lbs.	400		
	Seed: Sweet clover, lbs.	5		
	Korean lespedeza, lbs.	3		
	Common lespedeza, lbs.	3		
	Orchard grass, lbs.	12		
	Ky. bluegrass, lbs.	3		
	Redtop, lbs.	2		
	White clover, lbs.	.5		

1 Production and yield data are for level land except those for pasture mixtures which are for rolling to steep upland.

2 Corn on hill land will have similar requirements other than labor but the expected yield will be about 30 bus. and 1,900 lbs. stover.

Table 30. Expected normal production requirements for livestock and assumed production per year.

		Production requirements [1]			Production	
		Combination I	Combination II	Combination III	Kind	Amount
Dairy cows, per head	Corn,[2] bus.	15	18	12		
	Bran,[2] lbs.	150			Whole milk, lbs.	4,500
	Cottonseed meal, lbs.	100	200	100	or	
	Legume hay, lbs.	3,000	2,500	3,800	Butterfat, lbs.	180
	Corn stover, lbs.	500	1,500		and	
	Pasture, acres	2.5	2.5	2.5	Skim-milk, lbs.	4,000
	Breeding fees, dollars	1.00	1.00	1.00	Cull cows, lbs.[3]	120
	Miscl. costs, dollars	1.00	1.00	1.00		
Veal calves	Whole milk, lbs.	500			Veal, lbs.	150
Dairy calves,[3] per head (Birth to 1 yr. of age)	Corn, bus.	2	1	1		
	Bran, lbs.	100		50		
	Skim-milk, lbs.		2,000	1,500	Dairy heifer,	
	Whole milk, lbs.	450	100	100	1 yr. of age	1
	Legume hay, lbs.	600	600	800		
	Pasture, acres	.5	.5	.5		
	Miscl. costs, dollars	.10	.10	.10		
Dairy heifers,[3] per head (1 to 2 yrs. of age)	Corn, bus.	3	5			
	Bran, lbs.	100				
	Legume hay, lbs.	500	1,000	1,000	Dairy cow,	
	Corn stover, lbs.	1,000		1,000	2 yrs. of age	1
	Pasture, acres	1.5	1.5	1.5		
	Breeding fees, dollars	1.00	1.00	1.00		
	Miscl. costs, dollars	1.00	1.00	1.00		
Bull, dairy, per head	Corn, bus.		8			
	Legume hay, lbs.	1,500	2,500	2,500		
	Corn stover, lbs.	1,500	2,000			
	Pasture, acres	2.5		2.5		
	Depreciation, dollars	10.00	10.00	10.00		
	Miscl. costs, dollars	.50	.50	.50		
Beef cows, per head (Producing feeder calves)	Corn, bus.	5	5	8		
	Cottonseed meal, lbs.		50	50	Butterfat, lbs.	40
	Legume hay, lbs.	2,500	2,000	2,000	Skim-milk, lbs.	900
	Straw, lbs.	300		500	Cull cow,[4] lbs.	100
	Corn stover, lbs.	2,000	3,000	2,000	Feeder calf,[5] lbs.	375
	Pasture, acres	2.5	2.5	2.5		
	Breeding fees, dollars	1.00	1.00	1.00		
	Miscl. costs, dollars	.50	.50	.50		

1 Only one of these feed combinations is used at a given time, the particular combination depending upon the kind of feed grown and the prices of different feeds.

2 Up to 50 percent, oats may be substituted, lb. for lb., for corn or bran in any of these combinations.

3 In each system enough dairy heifers are included to keep up the herd. For each dairy heifer kept, a cull cow weighing 720 lbs. would be sold. The average weight of the cull cows sold would probably be between 750 lbs. and 850 lbs., the difference being deducted because of death losses.

4 If cows are culled out of the herd at 11 yrs. of age on the average, weighing 1,000 lbs. assuming a death loss of 10%, there will be 100 lbs. of cull cow for sale per cow in the herd.

5 With a 90% calf crop raised the sale of feeder calves weighing 475 lbs., and replacing one-ninth of the cows annually with heifers raised, there would be 375 lbs. of feeder calf for sale per cow.

Table 30. (Continued)

		Production requirements			Production	
		Combination I	Combination II	Combination III	Kind	Amount
Beef heifers, per head (1 to 2 yrs. of age)	Corn, bus.	4				
	Legume hay, lbs.	800	1,200			
	Corn stover, lbs.	1,000	1,000		Beef heifer, 2 yrs. of age	1
	Pasture, acres	1.5	1.5			
	Breeding fees, dollars	1.00	1.00			
	Miscl. costs, dollars	.50	.50			
Bull, beef, per head	Corn, bus.			8		
	Legume hay, lbs.	1,500	1,000	800		
	Corn stover, lbs.	2,000	3,000	2,000		
	Straw, lbs.	400	400	400		
	Pasture, acres	2.5	2.5	2.5		
	Depreciation, dollars	3.00	3.00	3.00		
	Miscl. costs, dollars	.50	.50	.50		
Hogs, per 100 lbs., live wt. produced[6]	Corn, bus.	6.2	7.0	7.5		
	Tankage, lbs.	13		16		
	Shorts, lbs.	80			Pork, lbs.	100
	Skim-milk, lbs.		300			
	Pasture, acres	.1	.1	.1		
	Miscl. costs, dollars	.05	.05	.05		
	Breeding fees, dollars	.10	.10	.10		
Poultry per mature head	Corn, grain, bus.	1.5	1.25	1.2		
	Corn, ground, lbs.	10	8.0	20		
	Bran & shorts, lbs.	3.5	17.0	20	Eggs, doz.	8
	Meat scrap, lbs.		2	10	Fryers, lbs.	2
	Oyster shell, lbs.	4	4	4	Hens, lbs.	4
	Skim-milk, lbs.	160	100			
	Miscl. costs, dollars	.02	.02	.02		
Workstock per head	Corn,[2] bus.	35	35	30		
	Mixed hay, lbs.	2,500	3,600	4,000		
	Corn stover, lbs.	2,000		1,000	Hours of work	1,000
	Pasture, acres	2.0	2.0	2.0		
	Depreciation, dollars	10.00	10.00	10.00		
	Miscl. costs, dollars	2.50	2.50	2.50		

6 Feed requirements are sufficient to take care of the breeding animals in addition to fattening the pigs. If no pasture is available the grain should be increased by about 10 percent and the protein feed by about 50 percent.

The systems of farming and land use suggested in the budgets are based upon assumptions derived from this study and similar studies in the Southeastern Kentucky mountains. The most significant of these assumptions are as follows:

(1) Since the upland in the area is steep and expensive to cultivate and since the level land returns much more for effort expended, it is desirable to limit the cultivated crop area to the bottom land and the level upland.[1]

1 See footnote Page 189.

Table 31. Assumed relative prices for products to be sold and expense items to be incurred.

Products to be sold		Expense items	
Item	Price	Item	Price
	Dollars		Dollars
Cash crops:		Fertilizer:	
Tobacco (Burley), per lb.	.16	Superphosphate, 20%, per 100 lbs.	1.20
Wheat, per bu.	1.10	Nitrate of soda, per 100 lbs.	2.75
Corn, per bu.	.95	Complete, 4-12-8, per 100 lbs.	1.90
Sorghum molasses, per gal.	.60	Complete, 4-8-6, per 100 lbs.	1.75
Tomatoes, per bu.	.40	Seed and Plants:	
Potatoes, per bu. (Irish)	1.00	Soybeans, Virginia, per bu.	2.60
Livestock:		Korean lespedeza, per lb.	.15
Whole milk, Grade B, per 100 lbs.	1.75	Common lespedeza, per lb.	.12
Butterfat, per lb.	.30	Red clover, adapted, per lb.	.25
Cull cows, per lb. (dairy)	.03	Alsike clover, per lb.	.25
Veal calves, per lb.	.09	Alfalfa, per lb.	.30
Cull cows, per lb. (beef)	.04	Sweet clover, per lb.	.20
Feeder calves, per lb.	.05½	White clover, per lb.	.40
Hogs, fat, per lb.	.09	Orchard grass, per lb.	.20
Feeder pigs, per lb.	.10	Redtop, per lb.	.18
Eggs, per doz.	.20	Timothy, per lb.	.07
Fryers, per lb.	.18	Ky. bluegrass, per lb.	.20
Cull hens, per lb.	.15	Rye, per bu.	1.00
Colt, yearling, each	60.00	Oats, per bu.	.75
		Corn, per bu.	2.50
		Wheat, per bu.	1.25
		Potato seed, bu.	2.00
		Tomato seed, oz.	.20
		Tobacco, burley, per oz.	1.50
		Miscellaneous:	
		Twine, per lb.	.10
		Canvas, per yd.	.05
		Lead arsenate, per lb.	.25
		Threshing wheat, per bu.	.10
		Baling hay and straw, ton	2.50
		Limestone, per ton	2.50

Expense items	
Item	Price
	Dollars
Feed:	
Bran, per 100 lbs.	1.75
Shorts, per 100 lbs.	1.85
C. S. meal, per 100 lbs.	2.00
Tankage, per 100 lbs.	3.50
Oyster shell, per 100 lbs.	1.00
Baby chick feed, per 100 lbs.	3.00
Oats, per bu.	.60

(2) The level land found on each farm is small and should therefore be used to the best possible advantage. This means that wet land should be drained wherever possible, phosphate and limestone should be used to increase yields and all the level land cultivated as intensively as possible consistent with good rotation practices.

(3) The steep upland should be used for improved pasture where the slope of the land and the depth and productivity of the top soil will justify the necessary expenditure.

(4) Intensive crops like potatoes, tomatoes, beans, sorghum for syrup and tobacco, which use relatively large amounts of labor and provide a large income per acre of land, should occupy a good proportion of the bottom land if markets and other economic factors justify their production.

(5) Legumes should be grown in the rotation to help maintain the nitrogen supply, and they can be utilized most economically as hay.

(6) Dairy cows are best adapted to use the hay and pasture resources on the small farms found in the area.

(7) Poultry furnish a more profitable means of utilizing home-grown grains and skim-milk than do hogs.

(8) Since the level land will be devoted to harvested crops, some of the steep upland can be used for improved pasture in connection with the bottom land to good advantage.

(9) A greater supply of family labor than usual is available in this region and a major need is that so far as possible, the farm program should provide for full use of family labor thruout the year.

SUGGESTED SYSTEM 1

It has been shown that the average farm on Lower Big Richland Creek contains 75.9 acres of which 30.9 acres is in woods, leaving 45.0 acres available for crops. Suggested system 1 has been calculated for farms of this size with the average amount of cleared level land, 16.4 acres, and the average amount of cleared upland, 28.6. Twenty-five acres of this cleared upland is utilized as improved pasture and six-tenths of an acre is used for a garden. The balance, the least productive portion might well be devoted to woodland. Four-tenths of an acre of the level land will be in garden leaving 16 acres in rotation. The following four-year rotation is suggested for the level land:

1st year: Corn (followed with a cover crop of rye).

2nd year: Potatoes (or some other intensive crop better suited).

3rd year: Winter turf oats, hay and grain, two acres each[1] (A mixture of clovers and grass will be seeded in the oats).

4th year: Mixed clover hay (pastured after hay is cut).

A detailed budget for this system is shown in Table 32, Sections B to F. As was suggested previously the data shown in Tables 29, 30, and 31, have been used in the preparation of this budget. For example, the amount of seed, fertilizer and other materials used in the production of the four acres of potatoes is four times the requirements for an acre of potatoes given in Table 29. Similarly the total requirement for the four dairy cows is four times the feed, pasture, and other requirements given in one of the feed combinations in Table 30.

This system provides for four acres of Irish potatoes, an intensive cash crop which will yield a relatively large return per acre, or snapbeans, melons, sorghum for syrup, tomatoes and tobacco may be substituted for a part or all of the potatoes shown in this system without affecting materially the form of organization or the net income which can be expected. The conditions prevailing on the individual farm, including the adaptation of

[1] Winter wheat may be substituted for oats. This would enable the family to have wheat for home use. However, feed to replace the oats would need to be purchased for livestock fed.

the soil and the special aptitudes and abilities of the farmer, will help determine which of these cash crops will prove most desirable.

If a farmer had the ability, land and other necessary equipment to produce good burley tobacco, how would this crop compare with potatoes as a cash crop in this system of farming? By using the figures in Table 29 and 31, we find that the operating costs of growing four acres of burley tobacco amount to $30.53 and the gross income is $448.00. The operating costs of

Table 32. Budget for improved use of land and other resources of an average farm in Lower Big Richland Area.

Section A. Available land resources per farm by slope, elevation and use types.

Type of land	Total acres on farm	Less acres not cleared	Acres available for crops and pasture
Bottom land	16.5	1.9	16.4
Upland, level	1.8		
Upland, rolling	4.7	1.4	3.3
Upland, steep	52.9	27.6	25.3
Totals	75.9	30.9	45.0

Section B. Crops. Acres and estimated production by land types.

Crops	Level land		Rolling and steep		Total	
	Acres	Production	Acres	Production	Acres	Production
Corn, grain	4	160 bus.	2.5	75 bus.	6.5	235 bus.
Corn, stover	(4)	10,000 lbs.	(2.5)	4,750 lbs.	(6.5)	14,750 lbs.
Potatoes	4	400 bus.	—	—	4.0	400 bus.
Oats, grain	2	50 bus.	—	—	2.0	50 bus.
Oat hay	2	5,000 lbs.	—	—	2.0	5,000 lbs.
Clover hay	4	12,000 lbs.	—	—	4.0	12,000 lbs.
Garden	.4		.6		1.0	
Pasture	(4 aftermath)		22.5		22.5	
Totals	16.4		25.6		42.0	

Section B (Cont.). Crops. Acres, production and disposition of products.

Crops	Total		Farm use		Home use		Sales	
	Acres	Production	Feed	Seed	Amount	Value	Amount	Value
Corn, grain	6.5	235 bus.	222 bus.	1 bu.	12 bus.	$11.40	—	—
Corn, stover	(6.5)	14,750 lbs.	14,750 lbs.	—	—	—	—	—
Potatoes	4.0	400 bus.	—	—	15 bus.	15.00	385 bus.	$385
Oats, grain	2.0	50 bus.	50 bus.	—	—	—	—	—
Oats, hay	2.0	5,000 lbs.	5,000 lbs.	—	—	—	—	—
Clover hay	4.0	12,000 lbs.	12,000 lbs.	—	—	—	—	—
Garden	1.0					100.00		
Pasture	22.5							
Totals	42.0					$126.40		$385

Table 32. (Continued)

Section C. Crops. Seed, fertilizer and other materials required.

Crops	Acres	Seeds			Fertilizer and other materials		
		Kind	Amount	Value	Kind	Amount	Value
Corn	6.5	Corn	½ bu.	Farm	Superphosphate, 20%	975 lbs.	$11.70
					Twine	2 lbs.	.20
Potatoes	4	Certified	52 bus.	$104.00	Lead arsenate	8 lbs.	2.00
					Fertilizer, 4-8-6	1,600 lbs.	19.20
Oats hay	4	Turf oats	10 bus.	7.50	Superphosphate, 20%	1,000 lbs.	12.00
Mixed clover hay	4	Red clover	20 lbs.	5.00			
		Alsike clover	4 lbs.	1.00	Limestone	16,000 lbs.	20.00
		Korean lesp.	10 lbs.	3.00			
		Timothy	20 lbs.	1.40			
Rye, cover crop	(6.5)	Rye	9.75 bus.	9.75			
Pasture	2.5[1]	Sweet clover	12.5 lbs.	2.50			
		Korean lesp.	7.5 lbs.	1.15			
		Common lesp.	7.5 lbs.	.90	Limestone	5,000 lbs.	6.25
		Orch. grass	30.0 lbs.	6.00	Superphosphate, 20%	1,000 lbs.	12.00
		Ky. bluegrass	7.5 lbs.	1.50			
		Redtop	5.0 lbs.	.90			
		White Clover	1.2 lbs.	.50			
Totals				$145.10			$83.35

1 The entire pasture area of 25 acres will be seeded once in ten years, requiring the seeding of 2.5 acres per year on the average.

growing four acres of potatoes total $134.00 and the gross income is $400.00. This leaves a net difference of $141.47 in favor of the tobacco. However, several times as much labor will be needed to grow and market the tobacco crop and a tobacco barn or some other provision is needed to house and cure the tobacco crop whereas no buildings are necessary for the potatoes.

If on the other hand tomatoes are substituted for the potatoes, according to data in Tables 29, and 31, the operating expenses will be $17.33 and the gross income is $256. This leaves a net balance of $27.33 in favor of the system with potatoes according to the assumed price and production data referred to. The amount of labor and equipment needed is not greatly different for the two crops.

Limestone is applied at the rate of two tons per acre for the first round of the four-year rotation on the level land, and afterwards as found necessary, perhaps one to two tons every other round of the rotation. Usually it should be applied at the time of seeding small grain in the fall, prior to seeding the mixed clovers in the spring. Two hundred fifty pounds of

Table 32. (Continued)

Section D. Livestock. Estimated feed, pasture, and other expense items required, per year.

Kind of livestock	No.	Home-grown feeds: Kind	Home-grown feeds: Amount	Pasture acres	Purchased feed and other expenses: Kind	Purchased feed and other expenses: Amount	Purchased feed and other expenses: Value
Dairy cows	4	Corn Oats Oat hay Clover hay Corn stover	52 bus. 35 bus. 2,000 lbs. 8,000 lbs. 6,000 lbs.	10	Cottonseed meal Breeding fees Miscellaneous costs	800 lbs.	$16.00 4.00 4.00
Dairy heifers	2	Oat hay Clover hay Corn stover	1,000 lbs. 1,000 lbs. 2,000 lbs.	3	Breeding fees Miscellaneous costs		$ 2.00 2.00
Dairy calves	2	Corn Oat hay Clover hay Whole milk	4 bus. 600 lbs. 600 lbs. 900 lbs.	1	Bran Miscellaneous costs	200 lbs.	$ 3.50 .20
Veals	2	Whole milk	1,000 lbs.	—	—	—	—
Pigs (600 lbs., gain)	3	Corn Skim-milk	42 bus. 1,800 lbs.	.6	Pigs purchased (3) Miscellaneous costs	150 lbs.	$15.00 .30
Poultry	50	Corn Skim-milk	84 bus. 8,000 lbs.	—	Bran and shorts Oyster shell Miscellaneous costs	175 lbs. 200 lbs.	$ 3.15 2.00 1.00
Work-stock	1	Corn Oats Oat hay Clover hay Corn stover	32 bus. 14 bus. 1,000 lbs. 1,500 lbs. 2,000 lbs.	2	Depreciation Miscellaneous costs		$10.00 2.50
Totals		Corn Oats Oat hay Clover hay Whole milk Skim-milk Corn stover	204 bus. 49 bus. 4,600 lbs. 11,100 lbs. 1,900 lbs. 9,800 lbs. 12,000 lbs.	16.6	Feeds Livestock purchased Breeding fees Depreciation Miscellaneous costs		$24.65 15.00 6.00 10.00 10.00

superphosphate are applied at this time, and 150 additional pounds are applied to corn, in the row, at the time of planting. The small grain used in this budget is winter turf oats. The chief advantage of oats is that it furnishes more feed grain than other available small-grain crops and winter oats has the additional advantage of furnishing protection over the winter.

The budget provides for a rye cover crop to be sown on all the corn land. Four acres are sown as a cover crop and is turned under for potatoes. Two and one-half acres are sown as a cover crop and nurse crop on the steep land. It will be noted that two and one-half acres of corn are grown on the hill land where lower yields can be expected.

Table 32. (Continued)

Section E. Livestock. Estimated annual production and disposition of products.

Kind of livestock and product	Production	Disposition of products				
		Used on farm in production	Used in home		Sales	
			Amount	Value	Amount	Value
Dairy cows:						
Whole milk, 4%	18,000 lbs.	1,900 lbs.	5,000 lbs.	$87.50	444 lbs. B.F.[1]	$133.20
Veal calves	300 lbs.	—	—	—	300 lbs.	27.00
Cull cows	1 cow	—	—	—	1	22.50
Dairy calves	2 calves	2	—	—	—	—
Dairy heifers	2 heifers	1	—	—	1	35.00
Pigs:						
Pork, live wt.	750 lbs.	—	750 lbs.	67.50	—	—
Poultry:						
Eggs	400 doz.	25 doz.	100 doz.	20.00	275 doz.	55.00
Fryers	100 lbs.	—	75 lbs.	13.50	25 lbs.	4.50
Hens	200 lbs.	—	75 lbs.	11.25	125 lbs.	18.75
Totals				$199.75		$295.95

1 Butterfat produced from 11,100 lbs. of 4% milk, leaving 10,000 lbs. of skim-milk available for pigs and chickens.

Section F. Summary of receipts and expenses.

Income		Expenses	
Crop sales (Section B)	$ 385.00	Crops (Section C)	
Livestock and products (Section E)	295.95	Seeds	$ 145.10
Total cash receipts	$ 680.95	Fertilizers and other materials	83.35
Livestock products used in the home (Section E)	$ 199.75	Livestock (Section D)	
Garden and other crops used in home	126.40	Feeds purchased	24.65
Total gross income	$1,007.10	Livestock purchased	15.00
		Breeding fees	6.00
		Depreciation	10.00
		Miscellaneous costs	10.00
		Buildings	30.00
		Equipment	15.00
		Fences	20.00
		Taxes	18.00
		Insurance	2.00
		Total expenses	$ 379.10
		Return to labor, management and capital	$ 628.00
		Total	$1,007.10

Only a small amount of steep land can be improved for pasture each year and this can best be accomplished by breaking and cultivating the land.[1] The rye cover crop is seeded to protect the soil from erosion and to

1 In some instances steep land may be seeded to a pasture mixture without plowing by applying limestone and phosphate and seeding the bare land in the spring.

serve as a nurse crop for the grasses and clovers. Rye sown as a cover crop following corn should be sown by the middle of September, even tho it necessitates sowing before the corn is cut. Some early spring pasture may be obtained also. The limestone and superphosphate may be applied and the land smoothed down as much as possible at the time the rye is seeded.

Table 33. Budget for improved use of land and other resources of an average farm in Lower Stinking Creek Area.

Section A. Available land resources per farm by slope, elevation and use type.

Type of land	Total acres in farm	Acres not cleared	Acres available for crops and pasture
Bottom land	20	0	20
Upland, level	5	0	5
Upland, rolling	12	2	10
Upland, steep	53	53	0
Totals	90	55	35

Section B. Crops. Acres, estimated production by land types and disposition.

Crops	Level land		Rolling and steep		Total	
	Acres	Production	Acres	Production	Acres	Production
Corn, grain	6	240 bus.	2[1]	60 bus.	8	300 bus.
Corn, stover	(6)	15,000 lbs.	—	—	(6)	15,000 lbs.
Potatoes	3	300 bus.	—	—	3	300 bus.
Soybean hay	3[2]	12,000 lbs.	—	—	3	12,000 lbs.
Mixed hay	3	9,000 lbs.	—	—	3	9,000 lbs.
Pasture	9		6[1]		15	
Garden	1		—		1	
Totals	25		8		33	

Section B. (Cont.). Crops. Acres, production and disposition of products.

Crops	Total		Farm use		Home use		Sales	
	Acres	Production	Feed	Seed	Amount	Value	Amount	Value
Corn, grain	8	300 bus.	249 bus.	1 bu.	25 bus.	$25	25 bus.	$ 25
Corn, stover	(6)	15,000 lbs.	15,000 lbs.	—	—	—	—	—
Potatoes	3	300 bus.	—	—	15 bus.	15	285 bus.	285
Soybean hay	3	12,000 lbs.	12,000 lbs.	—	—	—	—	—
Mixed clover hay	3	9,000 lbs.	9,000 lbs.	—	—	—	—	—
Garden	1					100		
Pasture	15							
Totals	33					$140		$310

1 Two acres of rolling land is new seeding for pasture. Corn land will be seeded to rye in stalks in fall and then disked and seeded to pasture mixture in early spring.

2 The soybean hay will be produced on land subject to winter overflow and therefore will not be seeded to a cover crop.

Table 33. (Continued)

Section C. Crops. Seed, fertilizer and other materials required.

Crops	Acres	Seeds			Fertilizer and other materials		
		Kind	Amount	Value	Kind	Amount	Value
Corn[1]	8	Corn	1 bu.	$ 2.50	Superphosphate, 20%	1,200 lbs.	$14.40
Potatoes	3	Certified	39 bus.	78.00	Lead arsenate	24 lbs.	6.00
					Complete, 4-8-6	1,200 lbs.	21.00
Soybean hay	3	———	4.5 bus.	11.70	Superphosphate, 20%	600 lbs.	7.20
Rye pasture	6	———	9.0 bus.	9.00	Superphosphate, 20%	1,800 lbs.	21.60
Clover hay	3	Red clover	15 lbs.	3.75			
		Alsike clover	3 lbs.	.75	Limestone	12,000 lbs.	15.00
		Korean lesp.	15 lbs.	2.25			
		Timothy	15 lbs.	1.05			
Pasture, level land	3	Sweet clover	15 lbs.	3.00	Superphosphate, 20%	1,200 lbs.	14.40
		Korean lesp.	9 lbs.	1.35			
		Common lesp.	9 lbs.	1.08	Limestone	12,000 lbs.	15.00
		Redtop	6 lbs.	1.08			
Pasture,[1] rolling land	2	Sweet clover	10 lbs.	2.00			
		Korean lesp.	6 lbs.	.90			
		Common lesp.	6 lbs.	.72	Superphosphate, 20%	800 lbs.	9.60
		Orchard grass	24 lbs.	4.80			
		Ky. bluegrass	6 lbs.	1.20	Limestone	4,000 lbs.	5.00
		Redtop	4 lbs.	.72			
		White clover	1 lb.	.40			
Totals	28			$126.25			$129.20

1 Six acres of corn will be produced on level land and two acres on rolling land each year. The two acres of rolling land will be seeded to a pasture mixture the following spring.

The suggested mixture of grasses and clovers has sufficient variety and enough seed to give a good stand which should persist in the fields and supply abundant grazing for ten years or longer. Usually it will be necessary to keep the bushes, briars, and weeds cut the first few year until the pasture is well established after which only a small amount of cutting will be necessary.

SUGGESTED SYSTEM 2

More than eighty percent of the 176 farm operators on Stinking Creek in Knox County received income for work away from the farm. For the most part the families having the largest incomes from sources off the farm had the largest net incomes and the higher standards of living. A dependable source of income from work away from the farm appears to be a requisite for a satisfactory living on much of the land in the area. Therefore, in

Table 33. (Continued)

Section D. Livestock. Number and estimated feed, pasture, and other expense items required per year.

Kind of livestock	No.	Home-grown feeds: Kind	Home-grown feeds: Amount	Pasture acres	Purchased feed and other expenses: Kind	Purchased feed and other expenses: Amount	Purchased feed and other expenses: Value
					Bran	600 lbs.	$10.50
Dairy cows	4	Corn Legume hay Corn stover	60 bus. 12,000 lbs. 2,000 lbs.	10.0	Cottonseed meal Breeding fees Miscellaneous costs	400 lbs.	8.00 4.00 4.00
Veals	3	Whole milk	1,500 lbs.	—	—	—	—
Dairy calves	1	Corn Whole milk Legume hay	2 bus. 450 lbs. 600 lbs.	.5	Bran	100 lbs.	1.75
Dairy heifers	1	Legume hay Corn stover	1,000 lbs. 1,000 lbs.	1.5	Breeding fees Miscellaneous costs		1.00 1.00
Pigs	3	Corn Skim-milk	42 bus. 1,800 lbs.	—	Pigs purchased (3) Miscellaneous costs	150 lbs.	15.00 1.00
Poultry	50	Corn, grain Corn, ground Skim-milk	75 bus. 9 bus. 8,000 lbs.	—	Bran and shorts Oyster shell Miscellaneous costs	175 lbs. 200 lbs.	3.15 2.00 1.00
Work stock	2	Corn Legume hay Corn stover	70 bus. 5,000 lbs. 4,000 lbs.	4.0	Depreciation Miscellaneous costs		20.00 5.00
Totals		Corn Legume hay Corn stover Skim-milk Whole milk	258 bus. 18,600 lbs. 7,000 lbs. 9,800 lbs. 1,950 lbs.	16.0	Feeds Pigs purchased Breeding fees Depreciation Miscellaneous costs		25.40 15.00 5.00 20.00 12.00

setting up this budget for farming in the area, it has been assumed that some seasonal work away from the farm would be available. The proposed budget applies only to farms established on fairly level land with a satisfactory all-year automobile road, preferably near a local market and easily accessible to seasonal work off the farm.

The average farm on Lower Stinking Creek has slightly more than 20 acres of level land. Most of this is bottom land and part of it is subject to overflow in winter. Most farms in this area contain only a small proportion of rolling upland and large proportion of steep upland. Assuming these average conditions a budget for a 90-acre farm having 20 acres bottom land, 5 acres level upland, 12 acres rolling upland, and 53 acres steep upland has been calculated. The 25 acres of level land and ten of the 12 acres of rolling upland are utilized for crops and pasture. The remaining

Table 33. (Continued)

Section E. Livestock. Estimated annual production and disposition of products.

Kind of livestock and product	Production	Disposition of products				
		Used on farm in production	Used in home		Sales	
			Amount	Value	Amount	Value
Dairy cows:						
Milk, 4%	18,000 lbs.	1,950 lbs.	5,000 lbs.	$87.50	442 lbs. B.F.[1]	$132.60
Veal (3)	450 lbs.	—	—	—	450 lbs.	40.50
Cull cow	1 cow	—	—	—	1 cow	22.50
Dairy calf	1 calf	1 calf	—	—	—	—
Dairy heifer	1 heifer	1 heifer	—	—	—	—
Pigs:						
Pork, live wt.	750 lbs.	—	750 lbs.	67.50	—	—
Poultry:						
Eggs	400 doz.	25 doz.	100 doz.	20.00	275 doz.	55.00
Fryers	100 lbs.	—	75 lbs.	13.50	25 lbs.	4.50
Hens	200 lbs.	—	75 lbs.	11.25	125 lbs.	18.75
Totals				$199.75		$273.85

1 Butterfat produced from 11,100 lbs. of 4% milk, leaving 10,000 lbs. of skim-milk available for pigs and chickens.

Section F. Summary of receipts and expenses.[1]

Income		Expenses	
Crop sales (Section B)	$ 310.00	Crops (Section C)	
Livestock and livestock products (Section E)	273.85	Seeds	$ 126.25
Work off the farm (3 months)	150.00	Fertilizers and other materials	129.20
Total cash receipts[1]	$ 733.85	Livestock (Section D)	
Livestock products used in the home (Section E)	$ 199.75	Feeds purchased	25.40
Garden and other products used in home (Section B)	140.00	Pigs purchased	15.00
Total gross income	$1,073.60	Breeding fees	5.00
		Depreciation	20.00
		Miscellaneous expense	12.00
		Buildings	30.00
		Equipment	15.00
		Fences	20.00
		Taxes and insurance	20.00
		Total expenses	$ 417.85
		Return to labor, management and capital	$ 655.75
		Total	$1,073.60

1 Variations from the proposed farm organization would be necessary to fit individual situations, particularly with regard to work off the farm. Therefore, the data presented should be considered as suggestive for making adjustments on individual farms.

55 acres are utilized for forest trees. The following four-year rotation is suggested for the level land:

1st year: Corn (followed with a cover crop of rye on the land not subject to winter overflow).

2nd year: Potatoes (on non-overflow land).
Soybeans (on land subject to overflow).

3rd year: Rye pasture (seeded in spring to hay and pasture grasses).

4th year: Mixed clover hay (on non-overflow land). Pastured after hay is cut.
Pasture (on overflow land).

A detailed plan for this system is shown in Table 33, Sections B to F. The data shown in Tables 29, 30, and 31, have been used in the preparation of this budget. Limestone and fertilizer requirement on the level land are similar to those described for System 1. One acre of the 25 acres of level land is used for home garden and truck.

The following five-year rotation is suggested for the 10 acres of rolling land utilized for crops and pasture (arranged in a five-year rotation):

1st year: Corn (rye seeded in stalks in fall).

2nd year: New seeding (corn stalks disked in spring, lime and fertilizer for pasture seeding applied and pasture mixture seeded).

3rd to 5th year: Pasture.

The length of the rotation suggested for the rolling land is based upon the probable need for reseeding the land after a few years by cultivating one year to remove weeds and bushes, followed with a cover crop in the fall and spring seeding as outlined above. This land usually is in a very low state of productivity and therefore will require considerable care in building up. After two or three rounds of this five-year rotation it could probably be lengthened to ten years or more.

Where desirable and practicable, snapbeans, melons, sorghum for syrup, tomatoes or tobacco can be substituted for all or part of the potatoes in this System, as discussed in Suggested System 1, without materially affecting the rotation.

SUMMARY

Knox County is typical of the Mountain Region of Eastern and Southern Kentucky comprising 38 counties or parts of counties. The lack of an adequate acreage of arable land in this region in relation to the number of persons living on the land, coupled with the lack of opportunities for nonfarming employment, has resulted in a large amount of poverty.

The territory in the study included all the land in two contiguous magisterial districts comprising 68,000 acres making up the entire drainage basin of Stinking Creek, one of the important tributaries of Cumberland River. This is a typical situation in which a

relatively dense population is undertaking to eke out a living by the cultivation of steep and eroded land.

The index of natural increase for the rural farm population of Knox County in 1930 was 193 as compared with 148 for the entire United States. The population per square mile in this area is greater than that of many of the more level and fertile agricultural counties of Kentucky.

The value of land and buildings averaged $1,167 per farm, or about $18 per acre, for the 176 farms. The dwelling houses averaged $187 in value. The farms averaged 63½ acres in total area. Corn was the principal crop and averaged 9.7 acres per farm. More than a third of the operators had no well-lying land and only about half of them had as much as five acres of well-lying land.

The number of persons per family averaged 5½ and the income available for spending averaged $68 per family. The spendable income available for the 60 families living in the rugged upper Stinking Creek territory was $48 per family as compared with $106 for the families living in the more favorable lower Stinking Creek territory.

Corn constituted approximately 68 percent of the acreage of all the land in harvested crops. Two-thirds of the corn is grown on hillsides having slopes ranging from 10 to 40 degrees or more. The result is that the hillsides have reached a stage of advanced erosion and very low productivity. The corn on the bottom land yielded almost three times as many bushels per day of man labor as that on the hill land.

On much of this steep land, young trees which, in a few years, would be large enough for saw timber, are constantly being destroyed to make way for corn patches. A few crops of corn exhaust the humus supply and cause such erosion that the land becomes incapable of growing either corn or good timber. The recleared land in many cases is capable of yielding not more than 10 bushels of corn per acre in a normal season. The entire crop of one man is often limited to three to five acres, or a total production of 40 to 60 bushels.

A study of a typical cropping cycle of 24 years on 28 hillside fields indicated that during the cycle an average of five crops of corn may be expected on such land cleared for the first time and

three crops after the land is cleared a second time. At the end of this cycle the economic usefulness of the land has been practically destroyed.

The principal bases used in classifying the land in this study were present use, topography, soil, and the condition of buildings. The land was divided into three classes according to the intensity of present and probable future uses. Land Class I, practically uninhabited and consisting of land almost wholly rough forest and waste land adapted primarily to the growing of trees, made up seven percent of the total acreage; land Class II consisting of land now largely in farms but unsuited to agricultural use, about 76 percent of the total acreage; and land Class III, fairly good agricultural land, about one-sixth of the total acreage. Rough forest and idle land made up 98 percent of Class I land, 71 percent of Class II land and 31 percent of Class III land.

Sixty-seven percent of the houses on Class II land and fifty percent on Class III land were classified as poor or dilapidated. Houses classified as poor usually had only one or two rooms and were of box or log construction, with four windows or less. Twenty-three and one-half percent of the farm dwelling houses situated on Class II land and 45.7 percent on Class III land were classified as good or fair.

Twenty-eight percent of the families averaged one person or less per room, 35.6 percent had from 1.1 to 2 persons per room, 25 percent from 2.1 to 3 persons per room and 11.6 percent 3.1 or more persons per room.

To throw light on the capability of the more level land for furnishing a living for its operators and affording resettlement opportunities for families living on rough submarginal land, a land-use analysis was made of two blocks of land in the same county located along the Cumberland River and in the valley of Big Richland Creek, a tributary of Cumberland River.

The block of land along Big Richland Creek consisted of about 15,000 acres made up of all the land of 165 contiguous farms, these averaging 90 acres in size, 17½ percent being level land, and the remainder steep hillside land. Forty-six percent of the level land was in need of drainage. On the 2,272 acres of bottom land there were 266 acres of corn land which usually is overflowed in summer. The

total crop failures resulting from such overflows amounted to 1.8 crops out of 10 crops, the average annual loss being 4.3 bushels for each acre of corn planted.

The Cumberland River block consisted of 3,089 acres comprising all the land of 42 contiguous farms bordering the river, the farms averaging 74 acres in size, 47 percent being level and 53 percent hillside land. Of the 1,018 acres of bottom land 21.7 percent was in need of drainage. On this bottom land there were 87 acres of corn on land which commonly is overflowed in summer. On this land there are two complete crop failures out of 10 crops of corn, the average annual loss being 6.1 bushels for each acre of corn planted.

The study indicates that more than three-fourths of the 165 farms in the Big Richland Creek bottoms have insufficient land for successful full-time farming; that there is at present a surplus farm population on this creek; and that any program of relocation of families from more rugged sections would further aggravate the situation.

The block of land made up of the 42 farms in the Cumberland River area furnishes land resources sufficient for the people living on this land at present and offers no opportunity for the resettlement of families from other land except to the extent that incoming families replace present occupants.

Plans for two effective farming systems are presented on pages 204 to 213. These systems require a minimum of between 18 and 25 acres of well-lying land per farm and are based on the use of intensive enterprises and methods. Because well-lying land is so scarce in the area, there is the possibility for only a few families to have such farms as those suggested and these farms would be confined to land along the river and lower ends of the creeks.

PROPOSALS FOR THE BETTERMENT OF CONDITIONS FOR THE PEOPLE OF THE AREA

The problem of dealing with submarginal land in this area differs from that in submarginal areas from which most of the people have migrated. As has already been pointed out, this eastern Kentucky area has a relatively dense population. "It is characteristic of our Kentucky mountain areas that for the time being, many of the occupants are satisfied to remain, partly because they are unac-

quainted with or unadapted to other modes of existence. Any proposal regarding such land must take these people into consideration. Although the land is essentially submarginal from the point of view of commercial farming, any attempt at the present time to stimulate the evacuation of these areas would be unwise. On the contrary, a wiser present policy is to help them make the best of their meager environment."[1]

An analysis of the available facts seems to warrant the conclusion that areas of land, such as that designated as Class I, might well be reserved at once as permanent forest land. On land in Class II, consisting of the rough land in the upper reaches of the forks of the creeks, farming should eventually be abandoned and the land reserved for permanent forest use. Land in Class III, consisting of areas with a considerable proportion of productive, level arable land, may well be used permanently for agricultural production.

The immediate need is to find means of making the maximum use of existing land resources. This would call for the use of the more intensive kinds of crops and intensifying the culture of all crops on the limited areas of good agricultural land.

Families on the rougher, poorer land should be encouraged and assisted to develop as completely as possible their limited land resources with the object in view of living where they are until opportunities for resettlement in industry or on suitable agricultural land become available. Some of the sloping land might well be terraced. On farms where there is no level land the special preparation of garden plats of limited area by the construction of retaining walls on productive land would enable families to produce a considerable part of their food supplies and thereby lessen the calls for public relief. Eventually such farms should be evacuated, but the best policy requires that the evacuation be done slowly and voluntarily. A period of a generation or more might be required for this evacuation.

The number of persons who have migrated from the area in past years has been relatively small, this being partly due to the isolated situation of the area caused by physiographic barriers and lack of roads and railroads to the outside world. The people remained in their meager environment because they were unacquainted with

1 From an address by Dean Thomas Cooper of the College of Agriculture, University of Kentucky.

and fearful of other places of abode outside their own region. However, a large proportion of the limited number who did migrate to other sections made valuable contributions to the life of the communities to which they went and for most of them the change of location meant a notable improvement of their economic and social well being.

Families that can get industrial employment outside the region should be encouraged to do so and industrial enterprises might well be encouraged to locate at various points in the area. However, the outlook for getting such industries started is one of the most difficult and discouraging aspects of the rehabilitation of these people. A limited number of the families of the area possess the qualifications necessary for successful farming in areas of good agricultural land. Such families, if they desire to relocate, should be given guidance and assistance. The relocation should be as near the home locality as feasible. To test the possibilities of such relocation it may be advisable for a government agency to furnish aid by acquiring tracts of land to be made available to competent families on a long-time plan of repayment and low interest rates.

Since only a minor fraction of these stranded families possess the qualifications for commercialized farming, and since a large proportion of them require the close supervision common in urban jobs, the resettlement of such families, if undertaken, should be on small subsistence plats near possible opportunities for urban occupation. This plan is the easiest to execute, involves the smallest outlay per family and offers the best prospect for success.

The proposal to rehabilitate families in their present location is predicated on the fact that, at present, industry or other nonfarming work is not available elsewhere for anything like the number of families which need to be rehabilitated. Expenditures on permanent structures for the rehabilitation of such families on the submarginal land upon which they are now living should be confined for the most part to minor repairs to make the present houses habitable. The young people would be expected to leave these submarginal farms and the land would ultimately be evacuated with the demise of the older people. The governmental agency in buying the land might well, in the case of the older owners, pay for it by the issuance of life annuity certificates, meanwhile permitting

the occupants to use the dwelling houses and the land under rigidly prescribed conditions. Cultivation would be permitted only on the level land, or the gentler slopes. The occupants would have the use of the present house and such land for intertilled crops and such pasture land, and firewood as might thus be permitted. At the death of the operators, entire possession would be taken by the governmental agency and the land would go back into forest.

The reforestation of such land would be a distinct public benefit. It would retard the run-off of water and alleviate the flooding of towns and cities on the lower reaches of the streams. It would lessen the washing off of soil into smaller and larger stream channels, filling them with silt. It would correct a maladjustment of population and serve as a means for rural slum clearance, changing the condition of the people from one of destitution and hopelessness to one of better economic and social opportunities.[1]

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1 The following quotation from an address of Secretary of Agriculture H. A. Wallace, made in Louisville,October 2, 1937, is significant in connection with the problem of dwellers on poor-land farms in the Kentucky mountains: "In those areas, as for example in the mountains where farms are very small and the soil is poor, there is absolutely no way of putting into the hands of the average farmer as much income as in those regions where the farms are large and the soil is rich. In working out our national farm programs, therefore, it is essential that as we try to discover what is fair between the regions we keep in mind the past situation. But in so doing we are exceedingly anxious to make it possible for those areas where the per capita earnings have been low to earn more. At the same time we do not want to encourage inefficient farming, or the continuance of farming on such small farms or such poor farms that the children have no chance."